

De Palma, in Mercedes, Wins at 89.84 m.p.h.

Breaks Record—Resta in Peugeot
Second—Stutzes Third and Fourth



Dividers of the Spoils

Car	Driver	Time	M.P.H.	Speedway
				Prizes
Mercedes	De Palma	5:33:55	89.84	\$22,600
Peugeot	Resta	5:37:27	88.91	10,900
Stutz	Anderson	5:42:27	87.6	5,600
Stutz	Cooper	5:46:19	87.11	3,700
Duesenberg	O'Donnell	6:08:13	81.47	3,000
Peugeot	Burman	6:13:19	80.36	2,200
Stutz	Wilcox	6:14:19	80.11	1,800
Duesenberg	Alley	6:15:08	79.33	1,600
Maxwell	Carlson	6:19:55	78.96	1,500
Sunbeam	Von Raalte	6:35:23	75.79	1,400

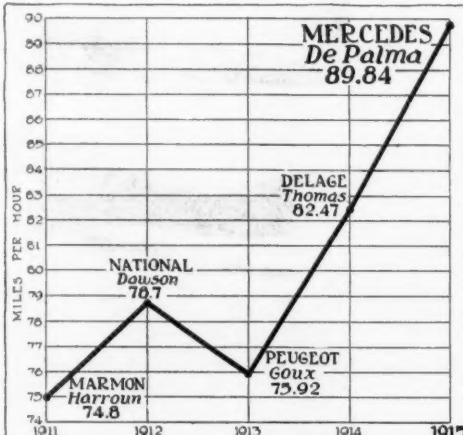
RALPH DE PALMA, WHOSE MERCEDES WON AT INDIANAPOLIS

INDIANAPOLIS, IND., Motor Speedway Official Stand, May 31—Special Telegram—Speeding at an average of nearly 90 miles per hour, Ralph De Palma today overcame his spell of bad luck on the Indianapolis Speedway and shot his Mercedes over the line a winner in the most spectacular race ever seen on the local speed arena. Three years ago he led to the third last lap and then fell out, but today he fought his rivals off one by one, an average speed of 89.84 miles per hour being necessary to do this, but when he had covered 350 miles he had his last rival back of him and for the last 150 miles led the way in one of the greatest races ever seen on this speedway.

When he crossed the tape with an average of 89.84 miles per hour he set a mark that may stand for some time on the Indianapolis track, for the Fates were kind to him, the bricks of the track being cold with scarcely a ray of sunshine from start to finish,

so that all blinding glare was cut out. Compared with the record of 82.47 established a year ago the mark of today is phenomenal, and particularly as one made by a motor under 300 cubic inches, whereas the limit a year ago was 450 cubic inches.

De Palma won today by real fighting, the fighting that always wins if there is an even break with the car. He had the stoutest rivals in veteran drivers of international fame. From the drop of the starter's flag he had to fight Dario Resta, fresh from winning the Vanderbilt and Grand Prix races on the coast, every foot of the way and had Resta not barely escaped a serious accident at 342 miles De Palma might not have had a margin of 3 minutes and 26 seconds over Resta in his Peugeot. When coming into the stretch on his 137th lap, Resta burst the right rear tire and skidded around on the course, fortunately not upsetting though he had to



Winners' speeds for each year

June 3, 1915

stop at the pit and change all four tires, allowing De Palma, who was then trailing him a lap, to jump into the lead. Before Resta was back on the course, De Palma had gained a lap and was setting a pace of over 90 miles per hour. Resta's steering gear had worked loose and he was not able again to catch up with the flying Mercedes, his pace slowing several seconds per lap.

An Uphill Fight

To win it was necessary for De Palma to fight an uphill battle for the first 350 miles. It was a struggle against the Stutz organization and against Resta's Peugeot, if not one, then the other, with scarcely a let-up and positions often changing every few laps due to stops being made for tire troubles.

From the drop of the flag, Resta, who was in the front row in starting, took the lead and held it for only a lap, when Wilcox driving No. 1 Stutz, jumped into the lead and held it by a small margin for 10 miles. Then his running mate, Anderson, took it and held it for 70 miles. Anderson set one of the hottest of paces for his half dozen pursuers who were bunched never more than a few lengths back of him, hungry for his honors as the hounds are when after the hare.

Resta to the Front

It was the irresistible Resta who finally overtook him when 82 miles were covered and held to the fore for 17 miles. It was in lap 58 or at 145 miles before De Palma ever got a chance to show in front. All of the time up to this point he was battling for position in the first group. In one lap he was third, the next he was back to fourth, then he was up to third or second, but never in first place. It was not until nearly the 100-mile mark was reached that he got firmly established in second place and it took nearly 50 miles more before he got into first place, for Resta was leading at 150 miles. De Palma displaced him at



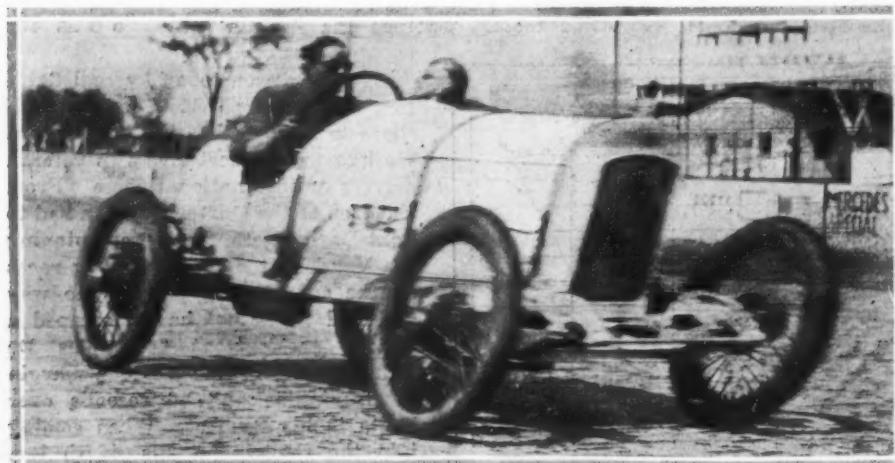
DARIO RESTA

Who finished second in the Indianapolis race, sending his Peugeot over the 500-mile course in 5 hours 37 minutes and 27 seconds, or at an average speed of 89.91 miles per hour, which, though it brought but second place in this year's race, was much faster than the best previous record



GIL ANDERSON

Driver of the first American car to finish in the 500-mile race. His Stutz finished in 5 hours 42 minutes and 27 seconds, making an average of 87.6 miles an hour



Anderson's Stutz hitting the high spots in the elimination trials for the 500-mile race at Indianapolis

175 and held first until 325 miles were covered when a stop for tires placed Resta again in front, but it was only for a short time, the skidding accident soon putting De Palma again in the lead and he was never headed off afterwards.

A Narrow Margin

De Palma was playing in the greatest of luck to finish and win. When he finished amid the deafening cheers of tens of thousands, few knew that on the third last lap a connecting-rod had let go and punched two holes in the crankcase. He slowed up perceptibly but gave no evidences of distress other than the usual sound of a missing cylinder. It is a coincidence that 3 years ago he went out in the third last lap and that misfortune should pursue him in this lap today. His troubles 3 years ago were due to a connecting-rod letting go.

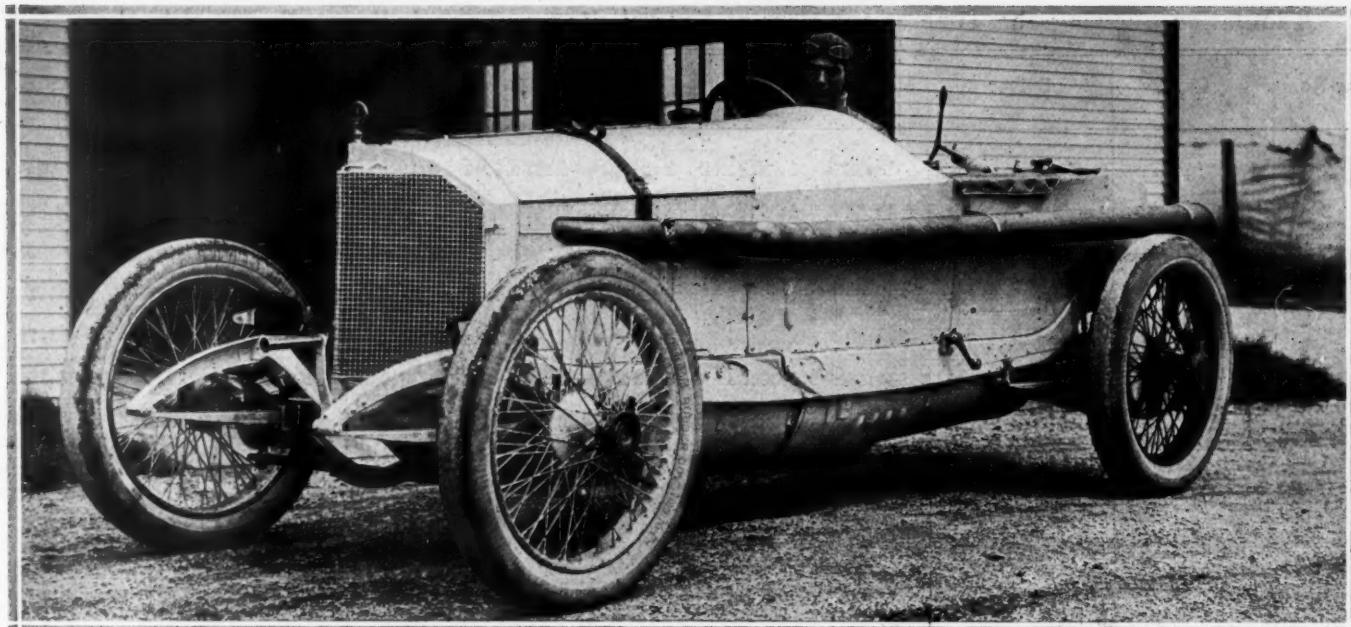
America's Showing Better

America came out much better today than a year ago when all of the first places were captured by the foreign contingent. Today the team of three Stutz cars gave a most amazing account of themselves, all three finishing within the money and two of them finishing third and fourth, a record for new cars which stands unequalled in racing history. Gil Anderson finished third a little over 8 minutes back of the leader and at an average of 87.60 miles per hour, while his team-mate, Earl Cooper, landed in fourth place, six minutes back of him.

Anderson's performance was spectacular, as he led for 70 miles in the earlier stages of the race, and then battled at every turn until the starter's flag ended the race. After taking the lead in the sixth lap he set a pace that soon put him well out in front, and maintained this until lap 34 when he stopped to change two outside tires and allowed the other leaders to pass him. When he got on the track again the leaders, Resta and De Palma, were nearly a minute ahead of him and he never got back into first or second place though he was always within close striking distance. The hoods were not raised on either of these two Stutz cars from start to finish and they ran with spectacular regularity.

The third Stutz, piloted by Wilcox, met with early difficulties and did not maintain the reputation it made for itself in eliminations, when it made the fastest lap. Wilcox was close behind Resta at the end of the first lap and was in the lead in the second lap and held it until the end of the fifth when he dropped back with valve trouble, it being reported that a valve spring had broken. Thus handicapped he drove to the end of the race and finished in seventh place, averaging 79.65 miles per hour.

For the first time in its history dry



The winning car—De Palma at the wheel of his Mercedes which won the Indianapolis 500-mile race at 89.84 miles per hour, breaking all previous records

speedway weather was not on the calendar and the race which was to have been run on Saturday was postponed until today. Indianapolis for the last week has been a rain zone, rain falling nearly steadily day and night. It was doubtful if it would be possible to run the race today. A Scotch mist was blowing across the track before starting, but as the day progressed the wind rose and finally an hour before the finish the sun began breaking through the clouds. Attendance was not up to a year ago, perhaps scarcely more than one-half. Much of the parking space being too soft for cars grandstand privileges were extended to them.

Duel Between Leaders

Today's battle between De Palma's Mercedes and Resta's Peugeot brings to mind the Grand Prize race a year ago in France, where these two cars did battle in one of France's greatest road races and when the Mercedes triumphed as it did today. From point of speed, Resta had a slight advantage on De Palma, being able to pass him on the stretches but losing out on the turns which De Palma drives in a superior way. For lap after lap these two veterans circled the 2 1-2-mile brick track not a length apart, one lap Resta leading in the stretch, losing it in the turns and again gaining it before crossing the tape. Lap after lap those in the grandstand rose and cheered as their favorites took the leadership. It was one of the grandest speed duels ever seen on the speedway, a duel fought at the pace of over 90 miles an hour. Had Resta not skidded on the turn entering the home stretch it might have continued much longer, but tires can only endure such a

pace for a limited time, and first De Palma had to stop and change tires, and then Resta stopped and changed all four, taking on supplies at the same time.

Record-Breaking Pace

Before the race started it was known there were eight or ten cars that were capable of setting a pace hotter than any ever known on the Speedway and from the start this was apparent. These were De Palma (Mercedes); Resta (Peugeot); Wilcox (Stutz); Cooper (Stutz); Anderson (Stutz); Rickenbacher (Maxwell); and perhaps Porporato (Sunbeam).

For the first 100 miles these seven were in a group not spaced from each other by more than a couple of lengths, sometime running side by side and at other time linked out in sheep fashion.

On the fourth lap Wilcox led by 1-2 second and the others were all bunched; the next lap they were closer; a lap later and the leader was out in front with the others battling for positions and so the duel went on lap after lap for more than 100 miles, first one losing position for tires and then another.

When Anderson got into the lead in the sixth lap for a time he opened a gap which widened to 100 yards; this was opened to half the length of the home-stretch. He was making lap after lap in 1:40, a pace of 90 miles an hour. Soon he had 25 seconds lead, the next lap it was 26, then 30, then 35, then 37, then 42. He was in an enviable position alone on the track with the fighting rivals a mile back until tire troubles overcame him.

Little Tire Trouble

Both Resta and De Palma made but two stops each, both for tires, and neither had any mechanical troubles from start to finish. De Palma consumed 3 minutes and 23 seconds as compared with 3 minutes and 19 seconds by Resta. De Palma's first stop at 157 miles was to change the two outside tires and his second stop at 300 miles was to change all four tires and take on supplies. Resta's changes were made at the same times, but Resta changed all four at each stop.

Pit Work Shows Improvement

Anderson lost 7 minutes and 2 seconds at the pit, making eight stops for tires and fuel. He changed the right tires at 85 miles, and then made changes at more or less regular intervals up to the finish. His running mate, Cooper, had better fortune, losing only 5 minutes



EARL COOPER

Whose Stutz followed that of his teammate, Anderson, finishing fourth in 5 hours, 46 minutes and 19 seconds, or at 87.11 miles per hour

Tabulation Showing the Time of the Cars at Several Stages of the Indianapolis 500-Mile Race

Car No.	Car	Driver	Miles: 50	100	200	250	300	400	500	M.P.H.
2	Mercedes	R. DePalma	33:56	1: 7:31.80	2:14:29	2:47:06.64	3:19:32	4:27:17	5:33:55	89.84
3	Peugeot	Resta	33:54	1: 7:30.45	2:15:08	2:47:35	3:20:27	4:27:11	5:37:27	88.91
5	Stutz	Anderson	33:22	1:08:10	2:15:10	2:48:44	3:25:06	4:32:36	5:42:27	87.60
4	Stutz	Cooper	33:59	1:07:37	2:15:46	2:49:30	3:25:03	4:35:47	5:46:19	87.11
15	Duesenberg	O'Donnell	35:30	1:11:36	2:24:06	3:05:33	3:41:11	4:53:50	6:08:13	81.47
8	Peugeot	Burman	34:43	1:09:59	2:22:27	3:03:10	3:38:04	5:01:46	6:13:19	80.36
1	Stutz	Wilcox	33:58	1:09:12	2:20:21	2:57:00	3:33:22	4:49:42	6:14:19	80.11
10	Duesenberg	Alley	35:42	1:11:23	2:21:59	2:59:00	3:35:53	4:58:37	6:15:08	79.33
19	Maxwell	Carlson	35:29	1:10:53	2:22:24	2:59:04	3:40:16	4:59:27	6:19:55	78.96
7	Sunbeam	Von Raalte	34:14	1:02:39	2:21:07	2:55:03	3:41:53	4:51:53	6:35:23	75.79
28	Emden	Haupt	44:05	1:09:00	2:52:42	3:35:21	4:15:45	5:39:37	7:03:30	70.75
14	Sunbeam	Grant	34:52	1:09:38	2:33:40	3:10:14	3:45:19	5:06:38	.....	.....
21	Maxwell	Orr	35:31	1:10:53	2:30:30	3:07:03	3:43:50	5:02:55	.....	.....
6	Sunbeam	Porporato	33:56	1:07:38	2:18:26	2:51:28	3:26:17	4:35:56	.....	.....
18	Sebring	Cooper	35:31	1:29:20	2:58:93	3:42:17	4:26:07	.....	.....	.....
22	Duesenberg	Mulford	36:24	1:17:56	2:42:21	3:20:39	.....	.....	.....	.....
16	Peugeot	Babcock	35:39	1:11:12	2:23:11	2:58:00	.....	.....	.....	.....
9	Kleinert	Klein	38:01	1:37:27	3:58:52	4:43:04	.....	.....	.....	.....
23	Maxwell	Rickenbacher	34:00	1:07:38	2:44:36	3:18:20	.....	.....	.....	.....
27	Cornelian	Chevrolet	39:25	1:10:53	.....	.....	.....	.....	.....	.....
17	Delage	J. DePalma	36:32	1:12:51	.....	.....	.....	.....	.....	.....
24	Mais	Mais	44:38	.....	.....	.....	.....	.....	.....	.....

at the pits, nearly all of the changes being on the right rear and right front tires. Anderson changed a right rear in 30 seconds and others in 32 seconds. Cooper made changes in about the same. The pit work among the leaders was better than in previous races, many of them having practiced changing tires steadily during preliminary spins.

The second group of cars to finish



EDDIE O'DONNELL

Covering the course in 6 hours, 8 minutes and 13 seconds at the rate of 81.47 miles per hour, his Duesenberg was fifth

was trailing the leaders by a half hour and was made up of O'Donnell's Duesenberg, Burman's Peugeot, Alley's Duesenberg and Carlson's Maxwell. They shifted positions quite generally during the race, O'Donnell finally landing fifth at 81.47 miles per hour. Burman in the sixth place averaged 80.35, thus making the sixth car to average higher than 80 miles per hour for the entire distance.

Wilcox's Stutz was seventh, Alley's Duesenberg eighth and Carlson's Maxwell ninth. The last car to get in the money was Von Raalte's Sunbeam, which was several laps back, having had hood troubles and tire difficulties.

After the ten getting in the money had finished, the eleventh car, the Emden, the only other running, was given a chance to finish. It was barely 3:30 p. m., when De Palma crossed the line and it was approximately 11-2 hours later before the Emden had finished the 500 miles and the race was over.

The performance of the three Sunbeam cars was a little disappointing as only one of them finished. Porporato was looked upon to set the pace if neces-

sary but his car was not fast enough. He led his team-mate Von Raalte by a dozen laps before he went out in lap 165 with a seized piston. Grant in the third Sunbeam was considerably slower, being generally four or five laps behind



BOB BURMAN

Sixth, in his rebuilt Peugeot in 6 hours, 13 minutes and 19 seconds for the 500 miles, an average of 80.36 miles per hour

Von Raalte. Until he went out, Porporato was running three or four laps back of the leader. He was doing laps in 1.40, a speed of 90 miles an hour, but his difficulty was in keeping up this pace. Grant was slower, taking 1.48 to the lap. Grant had trouble first with a broken brake connection which the technical committee insisted on being repaired and later when the mud apron worked loose and he was flagged to repair it. He withdrew with but fifteen laps to go but running 55 miles back of the leader.

The three Maxwell cars suffered troubles, only one finishing, namely, Carlson, who landed in ninth place. At the start Rickenbacher driving the sixteen-valve motor was among the leaders but spark-plug troubles set in and he could not keep the cylinders supplied and the car was finally put out with a broken connecting-rod at 250 miles. Orr, driving another Maxwell, broke a bearing in the rear axle and was out when the race was in its last stages.

Of the other cars that started, the little Cornelian went out with a broken valve at 180 miles. Before going out, the car ran out of gasoline on the back stretch and lost much time. The Kleinart loosened the partition between the gasoline and oil tanks, letting the two mingle and practically lost its standing. It was later taken out for smoking. The Sebring, Delage, Mais, Bugatti, and Purcell were all out early in the race.

Equipment of the Cars

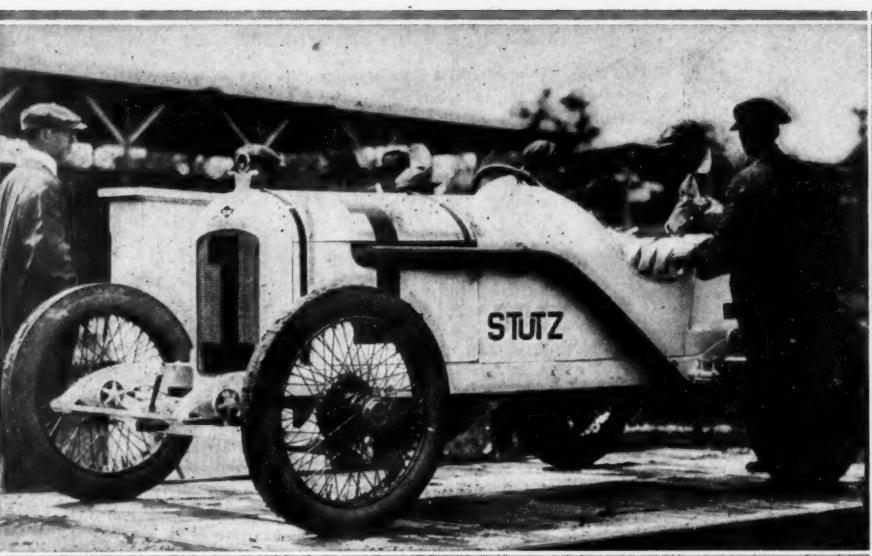
Bosch had 100 per cent. in the ignition line, every one of the twenty-four starters using Bosch magnetos, seventeen starters using the two-spark type and seven the single-spark, those employing the two-spark system being Stutz, Mercedes, Duesenbergs, Maxwells and three others.

In the way of radiator indicators, every car in the race was fitted with a Motometer.

While Silvertown cord tires did not have a 100 per cent. equipment yet they were used on all of the ten cars to finish in the money and on the eleventh car which completed the 500 miles. It was an unqualified victory for them. The winning Mercedes used a Packard carburetor, Bosch plugs and Rudge-Whitworth wire wheels.

Resta used a Zenith carburetor and Rudge wheels. On all three Stutzes the Stromberg carburetor was used and Houk wire wheels. The Master carburetor was used by Burman and three others. The Schebler was used on O'Donnell's Duesenberg.

In the way of lubricating oil, Oilzum was used by practically every car in the race, Ralph De Palma's Mercedes using Monogram, while the three Sunbeams, driven by Porporato, Von Raalte and Grant used castor.



Weighing-In Howard Wilcox's Stutz before the elimination trials. This car finished seventh in the 500-mile race

Overhead Valves Triumph

Life of Spark Plug Important Factor in Race—Fewer Pit Stops and Tire Changes

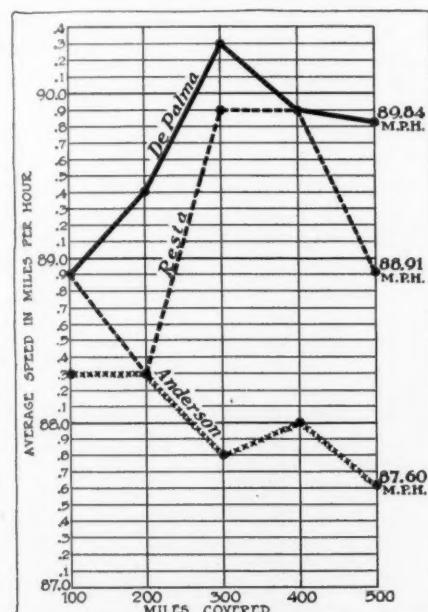
By A. Ludlow Clayden

AGAIN the overhead valve has vindicated itself and as was suggested in **THE AUTOMOBILE** last week, a car of this design was first to make its way over the 500-mile course at Indianapolis. Fifteen out of twenty-four entries had their valves in the head and the judgment of the majority has proved to be justified. This is not only

because the two foreign cars which finished first and second had engines of this type but because the excellent team performance of the three Stutz cars was direct evidence of the wonderful power of their motors. It would be impossible to say for certain, but it is practically undoubted that the performance of the Stutz is by far the finest ever accomplished by a manufacturer making his debut with a totally new type of engine. It is a better performance than any British team has yet put up with an overhead valve racing car and it has been excelled only by the showing of the Mercedes team in the French Grand Prix, last year. Most remarkable of all, perhaps, is that Wilcox's car with a broken valve spring still contrived to run for hours without losing a great deal of speed and to finish in so good a place. The Stutz showing can only be regarded as the greatest possible encouragement to American manufacturers; it is even more so than would have been a Stutz win without another American car left in the running.

Stutz Steadiness

The enormous importance of team performances from the viewpoint of showing the quality of design and construction is seldom realized but actually a good team finish may be regarded as proof of a new car, while a win for a new



Average speeds of the three leading cars in the 500-mile race at the end of each 100 miles



HOWARD WILCOX

The third of the consistent Stutz team, who finished in seventh place in 6 hours, 14 minutes and 19 seconds, an average of 80.11 miles per hour.

type may have a deal of dependence on luck. To all three of the Stutz cars throughout the race only two mechanical mishaps occurred, one being the breaking of a valve spring, already mentioned, and the other the coming loose of an exhaust pipe on the same car. No work whatever was done to either of the three cars save the necessary changing of tires and refilling of gasoline.

From the Stutz motor there is probably little to learn fundamentally; it is merely up-to-date design carried out with good materials and the best of workmanship; it is a splendid testimony of what an American manufacturer can do when he is prepared to give much time and money for the sole purpose of making a fine racing machine. Seeing that this is the first time the sixteen-valve racing motor has been really tried out in this country, the degree of success obtained is entirely remarkable.

100 Inches Difference

Piston displacement of this year's winner was more than 100 cubic inches less than that of the winning Delage of last year which, with its 4.1 by 7-inch motor had a displacement of 380.2 cubic inches. This year, the winning car while traveling at a much higher rate of speed had a piston displacement of only 270.9 cubic inches. The second car in the race in 1914 set to wagging the tongue of motor-dom with its small displacement of 183

cubic inches but that this was an exceptional performance is shown by the fact that the most consistent performers of this year were grouped very closely around the 270 mark. The winner had a lower displacement by only 3.1 cubic inches than the second car and the Stutzes which finished third and fourth had 296 cubic inches.

The winning two cars, De Palma's Mercedes, and Resta's Peugeot, have met before and the last occasion in France showed that there was little to choose between them. In the 500-mile race if Resta had not had trouble with his steering there is no doubt he could have made a little better time and the race would perhaps have been won in just over, instead of just under, 90 miles per hour.

Slack in Steering Gear

About 150 miles from the finish Resta found a great deal of slack in his steering gear, making it difficult to negotiate the turns as fast as they can be taken normally and examination showed the



TOM ALLEY

Pilot of the Duesenberg, which covered the five century circuit in 6 hours, 15 minutes and 8 seconds, with an average speed of 79.33 miles an hour

trouble to be in the worm gear itself. At the finish, there was 4 inches of free movement on the rim of the wheel.

Both De Palma and Resta ran right through the race without lifting the hood and both had only two stops at the pits, taking on tires and gasoline. De Palma took some oil but Resta did not even do this. It seems that De Palma

When and Why 13 Cars Dropped Out

CAR	DRIVER	LAP	REASON FOR ELIMINATION
Cino	Purcell	13	Broken timing gears
Bugatti	Hill	21	Pump gear broken
Mais	Mais	24	Ruled off for leaving course
Cornelian	Chevrolet	77	Valve went through piston
Maxwell	Rickenbacher	104	Broken connecting-rod through crankcase
Kleinart	Klein	112	Disqualified for smoking
Peugeot	Babcock	118	Cracked cylinder
Duesenberg	Mulford	125	Broken connecting-rod
Sebring	Cooper	155	Struck wall, breaking a wheel
Sunbeam	Porporato	165	Piston seized
Maxwell	Orr	169	Broke bearing in rear axle
Sunbeam	Grant	185	Withdrew with loose mud apron
Delage	J. DePalma	142	Loose flywheel

was extremely lucky to be able to finish a winner as something happened two laps from the finish which would have caused trouble speedily. A connecting-rod broke and punched two holes in the crankcase.

Both Cars Show Improvement

As a commentary upon the performance of these two cars the most striking thing is that they both seemed better than they were a year ago. And usually a year old car is not up to its original form. The reason is that just as much care has been taken in preparing these cars as would be given to making new ones and also it is thought that the Packard carburetor on the Mercedes is much better suited to American gasoline than the foreign carburetor found on most of the imported racing cars. It is a fact that the Mercedes throttles down much better than on the old instrument and there is little or no popping in the intake pipe when cutting out to a turn. This is the first important race for quite a long time that has been won by a car with a carburetor containing an air valve. Looking for the lesson from the leading car we find again that it is practically the same as that taught by the Stutz team success, namely, the excellence of a well-tried article prepared with an infinity of pains.

Having started on the foreign cars, we may turn to the adventures of the other Peugeots, of which the small one, in Babcock's hands, went out of business. Babcock had made one stop only for a right rear tire and up to his retirement seemed to be going well.

Burman's Many Mishaps

Burman had a curious experience; while driving, a sudden noise of most alarming character commenced and continued for a time and then vanished. Burman said he thought the whole engine was about to break up and that the



NOEL VON RAALTE

Entered as Norman Graham; this Sunbeam driver finished the race in 6 hours, 35 minutes and 23 seconds, at a speed of 75.79 miles an hour

sounds were most likely due to some fault in the lubrication. He suffered two mechanical troubles causing stops. After running nearly the 3 hours, the gear case cover became loose and required to be fixed, but this was far from serious as the job was done in 30 seconds, while the pit attendants changed some tires. After 4 hours' running he had to stop again to change spark plugs and finally the copper pipe which takes oil to the camshafts broke and had to be bound up with a piece of rubber hose. This happened at 4 1-2 hours from the start. Here, failure of the pipe is traceable to workmanship; probably it had not been annealed lately and copper pipes on racing cars which are naturally subject to severe shocks, soon become brittle. In fact, a pipe which is quite soft at the start of a 500-mile race, can and often does become as brittle as glass by the end of the race.

Porporato Seized a Piston

The other foreigners were the Bugatti and the Sunbeams and of these only the two English-owned cars were new enough to hope for a win. The Bugatti was obviously underpowered for a race of this caliber and the same is true of Grant's car, which was a fine machine when new. Porporato, who looked like standing up well among the leaders, suffered the misfortune to freeze a piston after running three-quarters of the distance. This was probably due to a broken piston ring but it will need an internal investigation to make sure. He also suffered a stop to fix his straps holding down the hood and another for the same reason. These cost 3 minutes, 45 seconds altogether which is equivalent to enough to make a two-place difference in the position on the scoring board. His partner, Von Raalte, lost his hood altogether and was stopped so that the referee could instruct him to fetch it and replace it, which cost a lot of time. Previously, he had a 3-minute stop to change two spark plugs. His most serious trouble was very peculiar, however. The platform which carries the magneto on these Sunbeams is apparently bolted securely to the side of the crankcase but is a separate piece. After running just over 5 hours this trouble caused a stop of 16 minutes and the ignition apparatus worked loose again an hour later, taking 19 minutes to fix on this occasion. Altogether, Von Raalte lost nearly an hour at the pits, the magneto trouble being the most serious. It is a remarkable fact that the Sunbeams in Europe, for the last 2 years, have suffered stops for curious little details like this, and it is certainly not due to unpreparedness. It seems much more like dogged bad luck.

Duesenberg Motor Does Well

First there is the Duesenberg team of three and secondly the Sebring and Klein-

the crankcase. The result was that the motor was so filled with oil that the smoke became a trouble and the car was ruled out. Klein had some trouble with his pump gland which leaked persistently and caused increasingly frequent stops for water right up to the time of his retirement.

The Sebring had persistent spark plug trouble, losing no less than 42 minutes on this score, while it had another stop to fix the accelerator pedal.

Duesenbergs Stood Up Well

Of the Duesenberg cars, the one driven by Alley suffered no trouble of a mechanical nature beyond a loosened exhaust pipe and finished the race in good shape. O'Donnell stopped only three times and his mechanical adjustments consisted of the replacement of a nut which had jarred off the brake bracket and a quick adjustment of the shock absorber. Mulford's Duesenberg was put out of the race by a stripped gearbox direct drive clutch but he had previously adjusted his steering gear and brakes.

Plugs Caused Maxwell Retirement

Failure of spark plugs to stand up to the demand upon them was the reason for the withdrawal of Rickenbacker's Maxwell and examination of the plugs which gave trouble almost as soon as they were put in, suggested that they were suffering



BILLY CARLSON

His Maxwell made an average of 78.96 for the race, taking 6 hours, 19 minutes and 55 seconds to cover the 500 miles

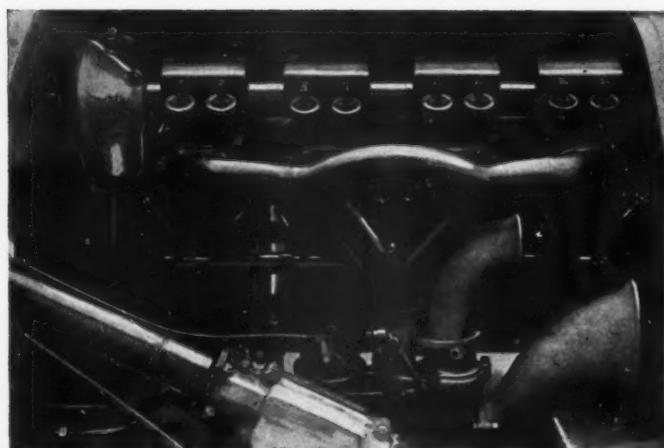
art with Duesenberg motors and the chassis of all are made up of well-known components. These cars as a team of five or as a team of three did quite well and it is to be noted that their numerous troubles were mostly not connected with the motor. Klein had an almost unique mishap in that his gasoline and oil became mixed by the failure of the partition dividing them. This made it impossible to lubricate the motor in the way intended, namely, by pumping small charges into

Cars, Drivers, Relief Drivers and Mechanics in the 500-Mile Race

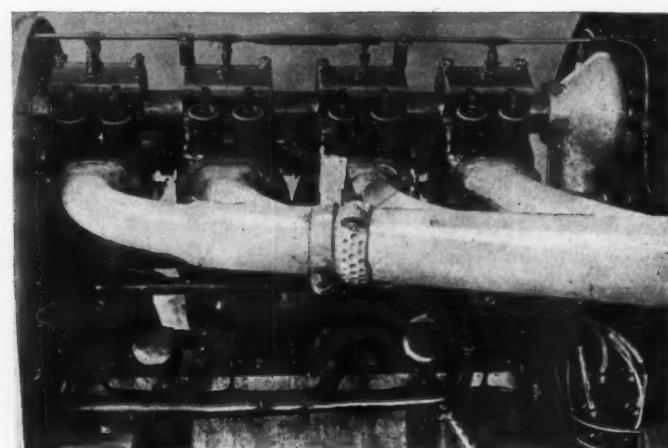
No. Car	Driver	Rel'f Driver	Mechanic	Rel'f Mechanic
1 Stutz	H. Wilcox	J. Aiken	C. W. Scott	H. H. Jones
2 Mercedes	R. De Palma	C. Bragg	L. Fontain	
3 Peugeot	D. Resta		F. McCarthy	
4 Stutz	E. Cooper	J. Aiken	R. Dutton	H. H. Jones
5 Stutz	G. Anderson	J. Aiken	T. Rooney	H. H. Jones
6 Sunbeam	J. Porporato	G. Morris	M. Ronco	T. Harrison
7 Sunbeam	N. Von Raalte	G. Morris	E. Copple	T. Harrison
8 Peugeot	R. Burman	R. Knapp	J. Gable	
9 Kleinart	A. H. Klein	C. L. Rogers	F. B. Leightner	
10 Duesenberg	T. Alley	W. Chandler	J. Henderson	H. Smith
12 Peugeot	G. C. Babcock	J. Lecain	J. E. Wicker	
14 Sunbeam	H. Grant	C. A. Limberg	B. Moore	
15 Duesenberg	E. O'Donnell	B. Keene	P. Henderson	A. H. Johnson
16 Peugeot	G. C. Babcock		R. Pallotti	
17 Delage	J. De Palma	C. Bragg	C. Phillips	E. C. Cheney
18 Sebring	J. Cooper	F. Galvin	L. Peio	
19 Maxwell	W. Carlson		P. Franzen	S. Lounsberry
21 Maxwell	T. Orr	E. Rickenbacher	R. Stafford	D. C. Latta
22 Duesenberg	R. Mulford	W. Chandler	P. Stevens	A. Johnson
23 Maxwell	R. Rickenbacher	H. Hughes	E. Schraeder	S. Lounsberry
24 Mais	J. A. Mais	F. Clemons	J. Jackson	J. Baker
25 Purcell	C. C. Cox	F. Farber	H. E. McCord	R. Knapp
26 Bugatti	J. R. Hill		W. Healy	V. Shobe
27 Cornelian	L. Chevrolet	J. Boyer	C. Klein	
28 Emden	W. Haupt		H. G. Donaldson	L. C. Donaldson



De Palma practicing tire changes on his Mercedes before the race. This practice stood him in good stead in the grueling speed duel which he won



Intake side of De Palma's Mercedes motor, showing mounting of Packard carburetor, which is said to have been an important factor in his victory



Exhaust side of the Mercedes motor, showing the vertical shaft at the rear for actuating the overhead camshaft, and also one of the two magnetos

from overheating. The most usual sort of failure consisted of a clean break across the insulation just within the steel plug body, which would naturally be the hottest part. It is worthy of comment that this consumption of spark plugs was the principal trouble in England and France last year, but it was overcome before the races in most instances. Better cooling arrangement seems the easy answer and that is none too easy. Somewhat curiously, the car ran well for over a couple of hours without the plug trouble setting in seriously, though there was stop 1 3-4 hours after the start for clutch adjustment. After running 3 1-2 hours the car was taken out on account of its continued plug failure.

Carlson Stopped But Once

Carlson's Maxwell had the distinction of being the only car among the finishers to stop only once. It was also the only Maxwell that escaped trouble, since Orr was put out near the end by breaking the bearings in one of the rear wheels. First,

the bearings went and this left the wheel dependent upon the withdrawable drive shaft, so the resulting tangle was utterly hopeless. This is a most unusual sort of failure and really reflects no discredit upon the Maxwell engineering. Orr had one short stop to examine plugs but did not change any. Thus we see that the two valve Maxwells had no ignition trouble, while the one with four valves per cylinder consumed plugs as fast as they were put in. This is proof positive of the higher mean effective pressure and the correspondingly higher temperature obtainable with the four-valve type of motor, and it is to be expected that the way out of the difficulty will be found before the latest Maxwell racer appears again upon a speedway.

Emden Slow but Sure

Of the remaining cars, the only one which finished was the Emden, which ran a slow but steady race and came last of all. It had only two stops, one soon after the start to change all four plugs and an

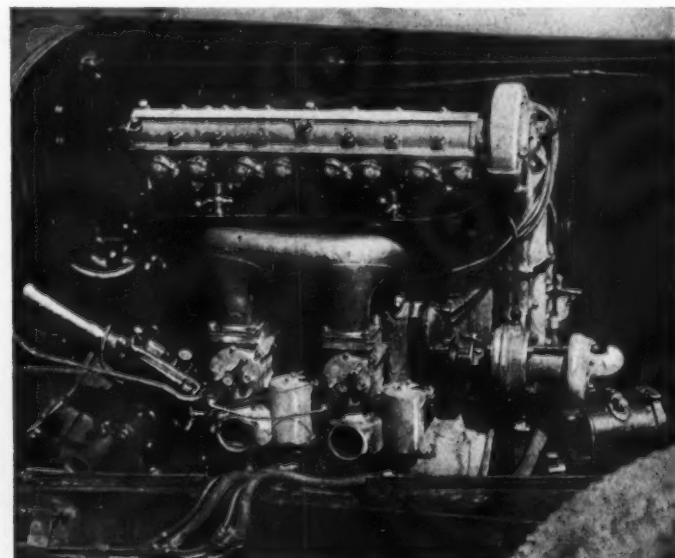
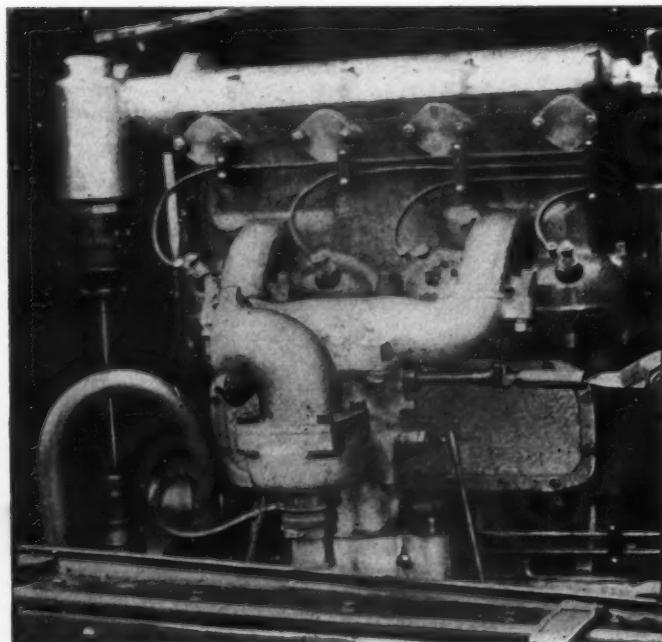
other at about one-half distance for water, gas and oil.

Of the absentees, John DePalma had extremely bad luck and the failure which caused him to retire in the 42nd lap scarcely could be blamed upon his accident in practice. After making a good pace till his first and last stop he found the flywheel running out of true, either due to being loose on the shaft or to the built-up crankshaft having loosened at the flywheel end.

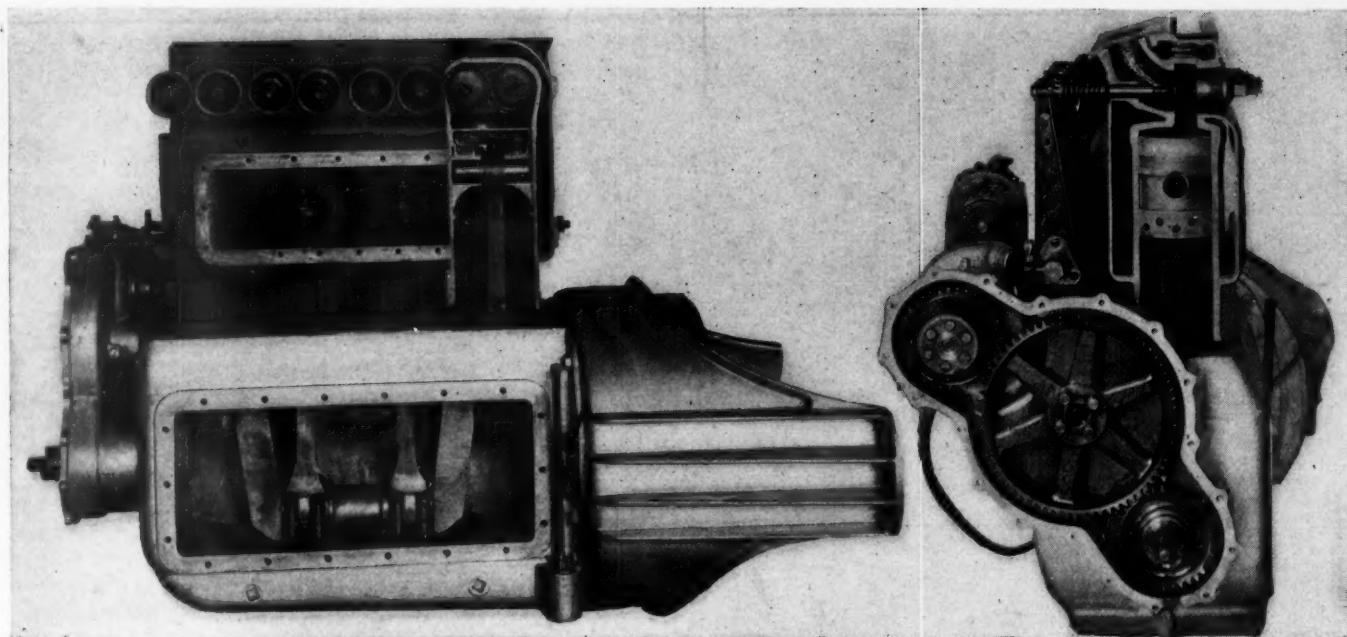
The Purcell stripped the timing gear, which drives the water pump during the 13th lap and the case was obviously hopeless, so this car was the first to give up the contest.

Mais, on the Mais special, was troubled with a flooding carburetor and stopped for this reason after covering only three laps. Pulling up again for the same cause after the 25th lap he overshot the pit and went around the road behind to return to his proper place, thereby earning disqualification.

After making a number of laps ex-



Above—Intake side of Sunbeam four motor. Note two carburetors
Left—Intake side of Maxwell motor, showing overhead camshaft



Side and end semi-sectional views of the Duesenberg motor, showing overhead valve mechanism and other features of construction

tremely slowly the Bugatti failed to put in an appearance, having broken down on some other part of the track, the reason reported being a broken connecting-rod or the same trouble which occurred in practice.

Cornelian Broke a Valve

The little Cornelian was one of the most regretted to fall out from a mechanical standpoint because of the remarkable speed shown for so small a motor. The trouble was a broken valve which fell inside the cylinder and did considerable damage. It seemed to be undercooled, as water was taken in three times during the 3 hours that the car ran, but the only mechanical work done consisted of a spark plug change.

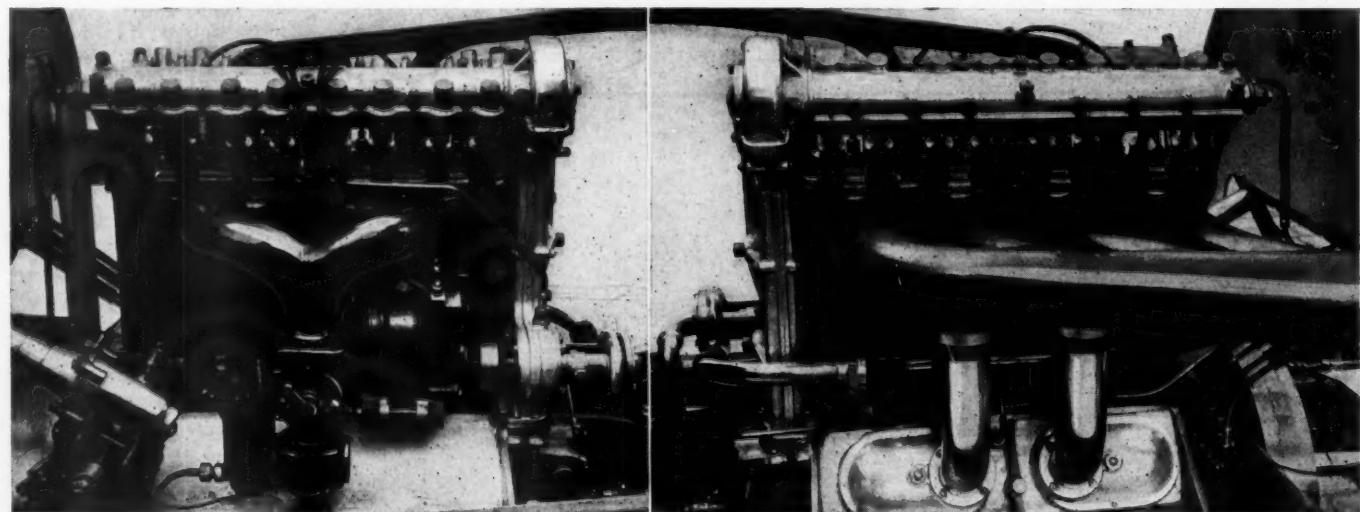
Ignition Troubles

The fastest cars of foreign manufacture had no plug trouble, three of the

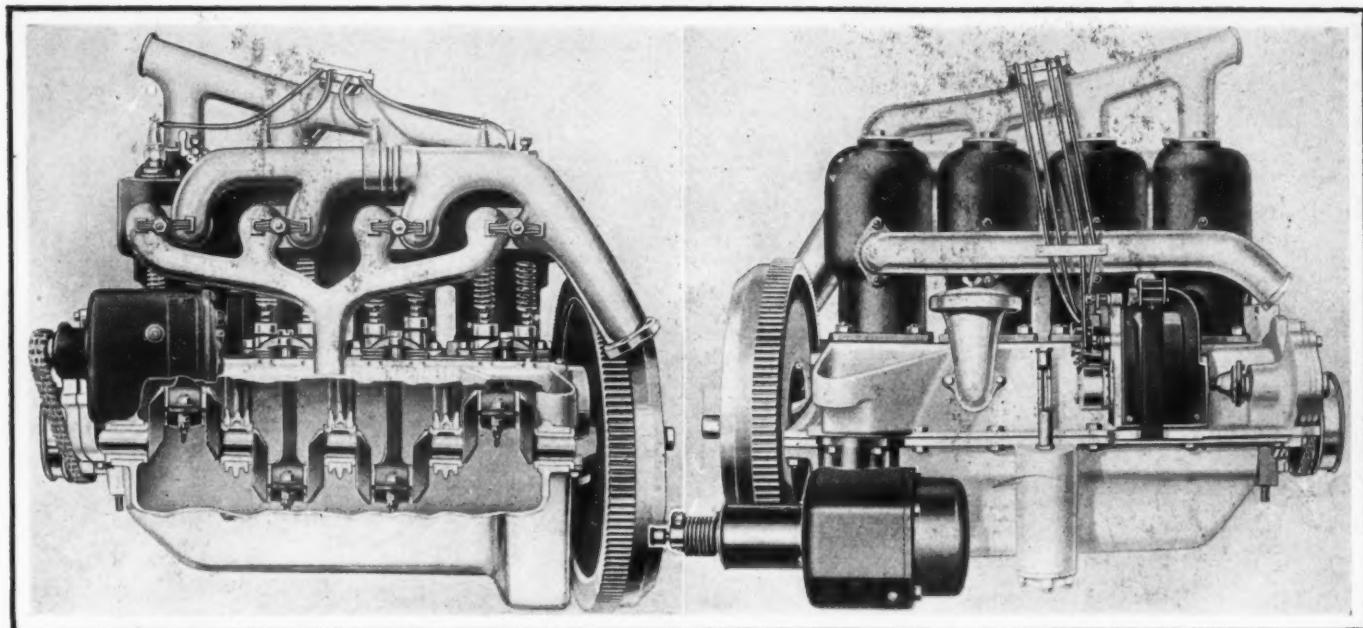
fastest American machines were almost equally free from it, but the majority of the contestants were sufferers. It was the Mercedes and Peugeot that had no spark plug difficulty during the practice for last year's French Grand Prix, every other car in that race having ignition trouble. The Sunbeams have never been able to overcome the tendency for the plugs to fail and it is only the slower of the American cars that seem fairly free. Even among the slowest, however, there was a good deal of plug changing done. Since Peugeot and Mercedes have found the secret there seems no reason why other people should not do likewise, and the probability is that the secret is simply to prevent the plug getting to more than some certain temperature. A trick which has not yet been tried would be to use plugs of much larger size than the standard pattern, say of double the diameter, for this would give wider insulating area and enable better allowance to be made for expansion. The idea is not new and is the property of a spark plug maker, but it has not yet been tried out. Of course, there is the other attitude possible, namely, that if Peugeot and Mercedes can build motors to take ordinary plugs, then other people should be able to do likewise. But even if this view is accepted, the other scheme should be worthy of experiment.

Mechanical Trouble Means Elimination

Once again the experience of the 500-mile race shows that it is useless to hope to win a race of this sort unless you are safe to go through without touching a spanner or even lifting the hood. The race of a year or 2 hence will have no pit work, bar the changing of tires and, perhaps, the supply of gasoline. Those who have mechanical difficulties, however slight, will retire gracefully at once.



Intake and exhaust sides of Peugeot motor, showing details of overhead valve mechanism. Note large manifolds and mounting of magneto



Left—Cutout view of intake side of Overland model 83 motor, showing five-bearing crankshaft. Right—Exhaust side, with mounting of magneto and Bendix gear for starting. Note oil gauge in plain sight

A New Overland Four—Price Lower

Model 83 Replaces 80 and 81—Bendix Gear for Starting—Cloth Upholstery—Many Detail Refinements

OVERLAND'S largest four-cylinder model for 1916 is revealed as being an attractive model, similar in general appearance to this year's cars, though selling under either of them at \$750 as a touring model and \$725 as a roadster. It is called model 83, and entirely supersedes models 80 and 81, the fours of the season now closing, which sold for \$1,075 and \$850, respectively. It is a larger car than model 81, and more refined and a later development than either of them.

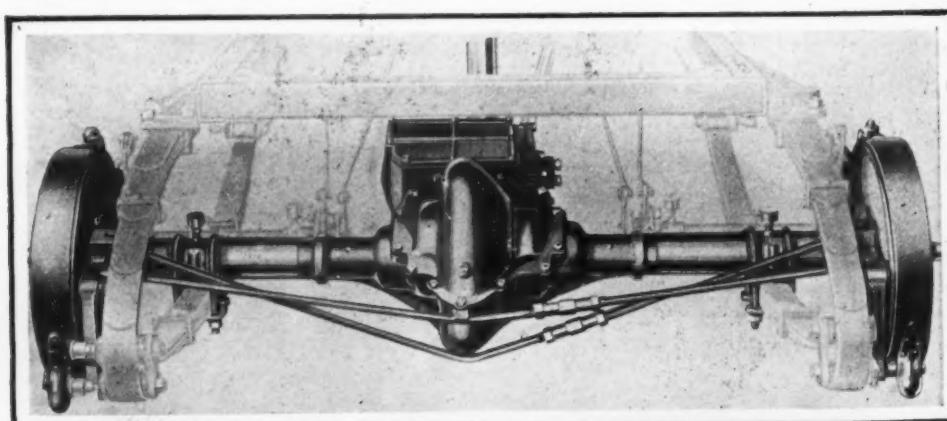
The enormous production facilities of the Overland plant are given as the reason for the price drop, for with a contemplated output of 75,000 cars for the coming year, it stands to reason that cost per car can be lowered materially. In fact, at this time a schedule of 400 cars a day is in force, and when the additions now under way are completed and

these new parts occupied, a production of 600 a day is figured on.

The model 83 is in line with former Overland construction throughout. It uses the same motor as the \$1,075 car of this year, namely the 4 1-8 by 4 1-2 type with cylinders separately cast. It is said to develop 35 horsepower on the block. The wheelbase is 106 inches, the clutch is a cone design, the gearset is incorporated with the rear axle unit, a floating axle is used, steering is on the left, control in the center, drive is through a torsion tube, and uses 33 by 4 tires.

Though in outward appearance the car is almost indistinguishable from model 80, a number of little refining touches have been bestowed. Cloth upholstery, leather bound, is the standard for all cars of this model. This is a radical step to take where such a large output is involved, but Overland makes clear its reasons for adopting such instead of either leather or imitation leather. The difficulty of securing enough good upholstery leather, together with the recent perfecting of waterproof cloth that is durable and easily cleaned are the principal points that led to the use of the latter. There is no doubt that cloth is very comfortable to ride upon, for it is not slippery, clings to the clothes of the passengers and really prevents them from sliding around on the seats.

The cloth is a worsted fabric



Rear axle and gearbox unit of Overland model 83, showing underslung springs and large brakes

with a waterproof coating on the under side. It is explained that cleaning is easy. Dust is removed with an ordinary brush, while grease and oil spots are taken off by first wetting with warm water, then rubbing on a little castile or ivory soap and scrubbing with a small brush, and finally rinsing with clean warm water.

Bendix Gear for Starting

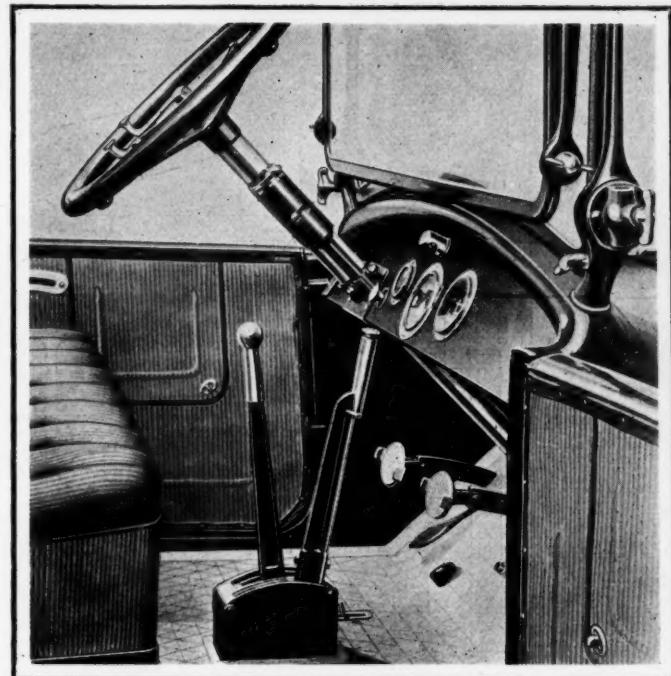
An improvement of note is the fitting of the Bendix form of driving connection between starting motor and flywheel. This was used only on the present six-cylinder Overland, but the Overland engineers like it so well that its adoption on the new four followed. This drive is not new to automobiles, and has been mentioned in these columns, but a brief description of it is merited here. The shifting of the gear is entirely automatic after the current is sent to the electric motor. The device is a weighted pinion on a threaded shaft, the weight serving to carry the pinion into engagement with the flywheel teeth.

Referring to the illustration at the right, page 980, the armature shaft M runs inside of a threaded sleeve A, on which the threaded pinion B can be screwed backwards and forwards. This pinion meshes with the teeth in the rim of the flywheel. A stiff coil spring C attaches at its outer end to the end of the armature shaft at D and its inner end attaches to the outer end of the threaded sleeve at E, which would be entirely free to turn on the armature shaft if it were not for the spring connection. The pinion B is weighted, and is loose enough on the shaft to be moved by the weight until the latter is in its lowest position.

When current is sent to the motor, the armature is revolved at a rapid rate and the weighted pinion is kept from revolving with this shaft by its looseness and by the action of the weight. It therefore, automatically screws forward along the threaded shaft A until it contacts with the flywheel teeth, meshing naturally due to the chamfer on one side of the teeth. When fully meshed, the pinion reaches a stop at the inner end of the screw shaft, and since it cannot screw further, it must now revolve with shaft A. This sudden rigid connection between the two would create a shock if it were not for the cushioning effect of the coil spring. Once the connection between A and B is made, the power from the starter goes through the coiled spring to the threaded sleeve and then through the gear to the flywheel. It is not until the spring is fully coiled that the whole power is transmitted.

Is Automatically Unmeshed

As soon as the engine starts under its own power, the flywheel obviously revolves faster than the armature shaft, and it thus increases the speed of the pinion gear over that of the threaded sleeve on which it is mounted. This serves to back the pinion off the threads, moving it in the reverse direction to its meshing movement but in the same manner, and



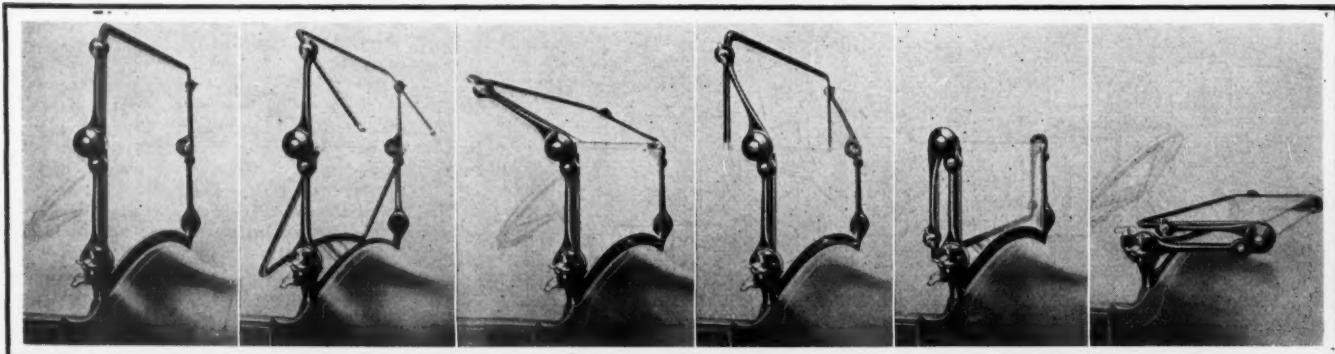
Clutch and brake pedals are adjustable for length, the starter button is located in the toe board and control levers permit easy entrance. Steering wheel is anchored near top to prevent vibration

finally unmeshing the two. This movement is automatic after the engine begins to run faster than the starter.

The device is foolproof because it is impossible to do harm to it by switching on the starter current accidentally after the engine is running. The weighted pinion, being out of balance, is twisted and binds on the screw shaft, revolving with it. This is a clutching effect and is due to the centrifugal force of the unbalanced weight.

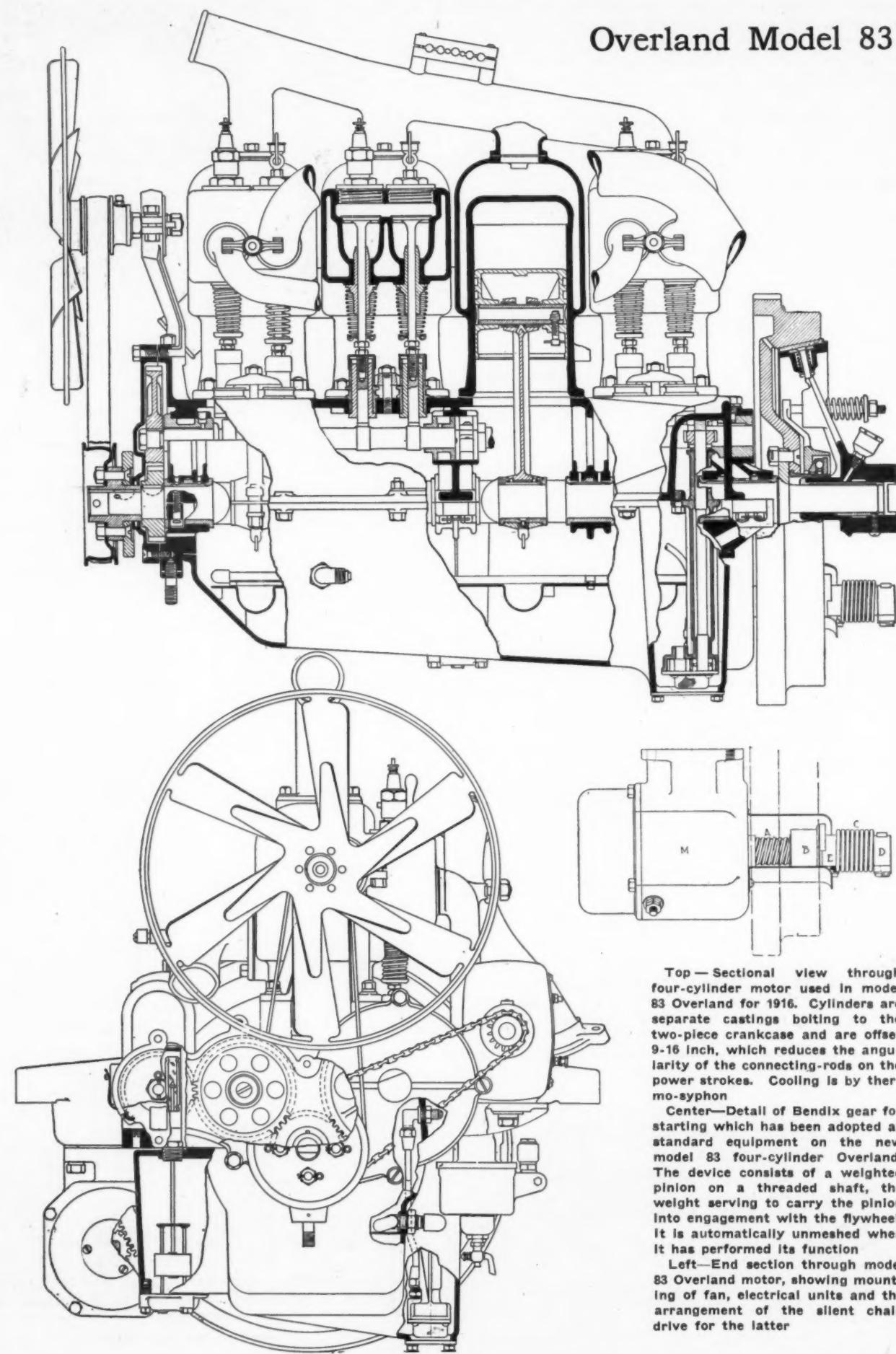
The new model is fitted with a somewhat different type of control box than that used on the model 80, the box performing the same duties as the old, of switching on the lights, carrying the horn button and including the ignition switch, but a special form of key is furnished with two slots in which this will fit. The upper slot is for operating the light switches, and the lower takes care of the ignition. Removal of the key automatically locks the switches. The horn button is on top. On the former box the light switches and the horn were operated by exposed buttons.

While both 1915 fours carried side lights, a noticeable change in the model 83 is the absence of these, the headlamps being provided with a dimming feature for city work. The headlamps are of special design with a quick method of focusing by moving the socket back or forward with a screwdriver. They are made by Auto-Lite and both the door and reflector have a sort of bayonet lock arrangement for hold-



Six of the many positions possible with the new windshield which is standard equipment on the Overland model 83

Overland Model 83



Top—Sectional view through four-cylinder motor used in model 83 Overland for 1916. Cylinders are separate castings bolting to the two-piece crankcase and are offset 9-1/8 inch, which reduces the angularity of the connecting-rods on the power strokes. Cooling is by thermo-syphon.

Center—Detail of Bendix gear for starting which has been adopted as standard equipment on the new model 83 four-cylinder Overland. The device consists of a weighted pinion on a threaded shaft, the weight serving to carry the pinion into engagement with the flywheel. It is automatically unmeshed when it has performed its function.

Left—End section through model 83 Overland motor, showing mounting of fan, electrical units and the arrangement of the silent chain drive for the latter.

ing them in place in the body of the lamp. A quarter turn clears the holding lugs so that either part can be taken out. The socket is entirely independent of the reflector.

Clutch Pedals Now Adjustable

Clutch pedals have been made adjustable for length, a feature that was formerly found only on the six. The pedal arms bolt to the levers proper, and there are several sets of holes so that the relative positions of the two parts may be varied.

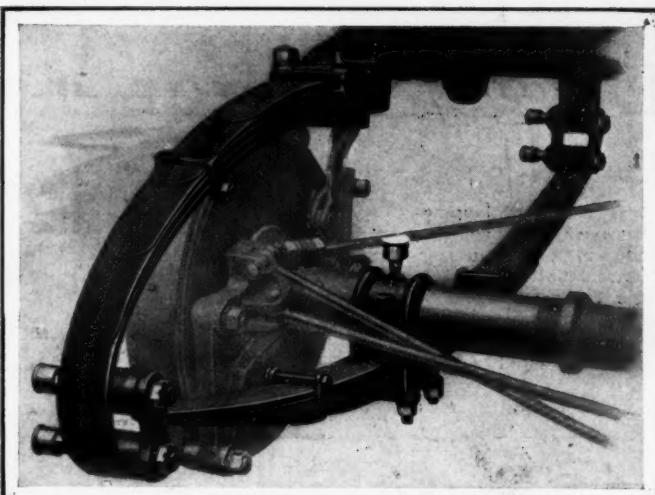
Front fastening of the one-man top is another point worthy of mention, and instead of fastening the front bow to the rigid side supports of the windshield, as is often done with this design of top, metal braces, hinged so as to lie flat when it is folded back, hold the front of the top in position. They attach to the top at about the same point the side supports of the windshield would ordinarily come and are clamped in sockets at the bottom of the windshield. The advantage of this is that the windshield can be hinged to fold at the point where the two glass edges meet and also at the bottom. This does away with immovable side pieces. The shield is practically the same as that used on model 80, and it admits of a wide range of positions for both top and bottom glasses.

Cylinders Offset 9-16 Inch

The motor is of the type in which each of the cylinders is a separate casting which bolts to the two-part aluminum crankcase. They are offset 9-16 inch which reduces the angularity of the connecting-rods on the power strokes. The cylinders are L-heads with valves on the left. The exhaust manifold is above the intake in standard fashion, and large passages are given intake and exhaust gases. The water connections are also large, due to the thermo-syphon system.

The five-bearing, carbon steel crankshaft is very rigid and acts as a big factor in reduction of vibration and consequently for smooth running. The three-bearing camshaft has integral cams acting directly upon the tappets. Pistons each carry two rings above the wristpin, and have oil grooves below it to aid in keeping lubricant out of the combustion chambers. Wristpins are hollow and attach in the piston bosses by set screws, the rod ends oscillating on bronze bushings. The standard construction for connecting-rods is adhered to. These are of I-beam drop-forgings.

In the constant-level splash lubrication, the oil is forced through a sight feed on the dash by a gear pump, whence it flows by gravity to the connecting-rod troughs, where it is splashed to the bearing surfaces, the rods having small



Overland 83 springs are 47 by 1 3-4 inches. Note the grease cup on swivel seat on axle and those on shackles

scoops on their ends. The pump is inside the crankcase instead of having it attached to the outside of the case as heretofore. The location is the same, and the pump design just as it was, but its inclosure helps to clean up the crankcase, and to prevent any waste of oil. Any which now might escape from the pump finds its way back to the reservoir in the bottom of the crankcase. Heretofore, any leakage from the pump was lost. The pump has a strainer as a part of it so that only strained lubricant reaches the bearings. The neat form of revolving sight feed is still fitted with a small vane which rotates when the oil is flowing and it is not difficult to see it even though the glass is fogged.

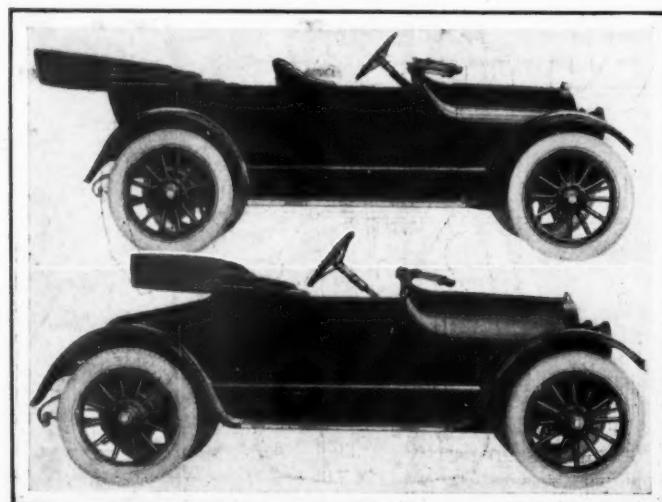
Ignition by High-Tension Magneto

The Auto-Lite lighting and cranking system has the starter unit placed on the right rear side of the crankcase underneath the motor arm, and the generator mounted on the opposite forward side with its drive through silent chain with the crankshaft. Ignition, by a separate high-tension magneto, is entirely independent of the lighting and starting system with the magneto driven through gear and shaft connection with the front gears and carried on the right forward side on an integral crankcase bracket. There is no change whatever in any of the electrical units. The usual equipment of automatic cutouts, circuit breaker and ammeter is provided so that the battery cannot be overcharged, and really gets its current at about the same rate regardless of the car speed.

The familiar Overland drive system used includes a cone clutch and back of it the propeller shaft is inclosed within a torsion tube, the flange of which attaches to the front of the rear axle gearbox, which in turn bolts to the differential housing. The clutch, a leather-faced cone, has a brake to stop the shaft spinning when gears are to be changed and has three main springs equally spaced to give a gradual engagement, and eliminate grabbing. These are placed close to the points of contact so as to make a good connection, and they distribute the tension so as to make declutching easy.

The propeller shaft carries a universal joint ahead of where it enters the torsion tube. This member is fitted with a yoke at its front end, the arms of the latter hinging to a cross member of the frame. Radius rods extend diagonally from the ends of the axle tubes to the front of the yoke to aid in preserving axle alignment. The gearset is of the usual three-speed type incorporating nickel-steel gears of stub tooth form. The axle is arranged for axle shaft removal independent of the axle housing, and the differential construction is conventional with four bevel pinions. Roller bearings carry the axle mechanism.

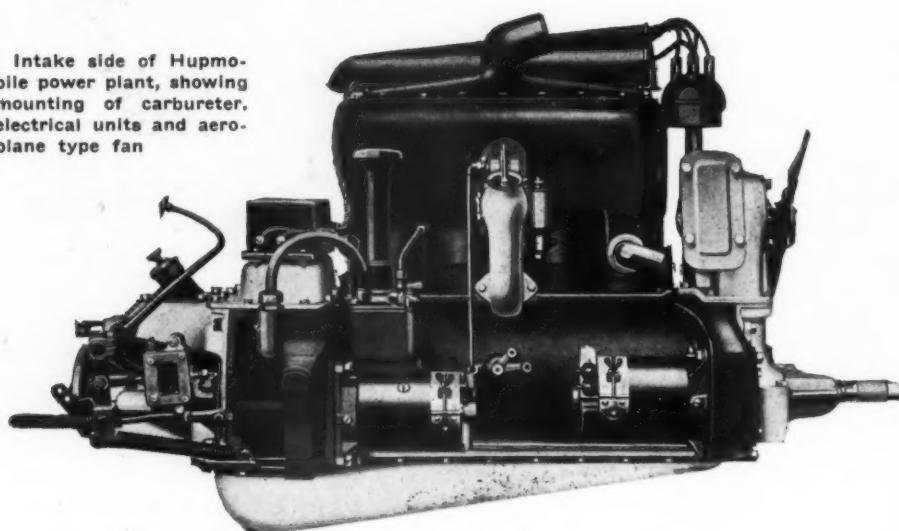
(Continued on page 993)



Upper—1916 model 83 Overland four-cylinder, five-passenger touring car which sells for \$750. Lower—Two-passenger roadster listed at \$725

Larger Motor in 1916 Hupmobile

Intake side of Hupmobile power plant, showing mounting of carburetor, electrical units and airplane type fan



LAST year the Hupmobile was redesigned altogether so, as would be expected, the changes for 1916 are not very great. Certainly the most important is the increase of cylinder bore from 3 3-8 to 3 3-4 which adds 46 cubic inches capacity as the stroke is still 5 1-2 inches; the actual capacity is therefore now 243 cubic inches as against 197 last year. Prices are lower, the five-passenger touring car selling at \$1,095 as against \$1,200 for 1915.

Another change is in the electrical equipment which is to be Bijur constant current type with two units but otherwise, apart from a few altered dimensions here and there, it is in the body that the characteristics of 1916 must be sought.

Externally the 1916 motor is very like that of 1915 as the extra 3-8 inch on the cylinder bore does not add materially to the over-all dimensions. Cast iron is used for the crankcase to give the maximum of rigidity to the crankshaft bearings, but the cylinders are not integral with the base, as this form of construction is liable to become too massive with fairly large motors with a long stroke. On the road the rigidity is noticeable by absence of vibration up to quite high speeds of revolution, for the Hupmobile motor is capable of high speeds, though it is not primarily a very high-speed engine, being designed rather with the idea of high power production at low and moderate rates of revolution. As an example of the success which has attended the maker's efforts in this direction, the motor pulls smoothly at 5 miles per hour on the top speed of 4 to 1 and accelerates rapidly without pounding. Moderate grades can be taken slowly on high gear and the car will get away easily. Of course the acceleration is more rapid on the second gear, as this gives the large valves and wide gas passages a chance to do their work, meaning that the motor speed rises very quickly and the car speed in proportion, so that up to 25 or 30 miles an hour one can jump away on second almost as quickly as one can depress the throttle pedal.

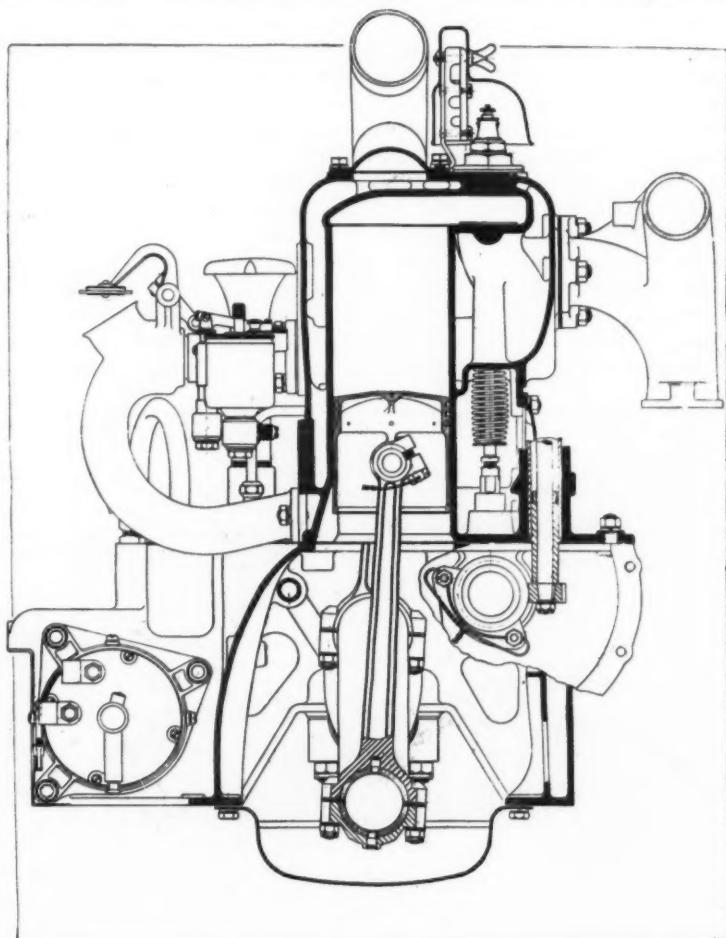
This rapid acceleration is gained partly by care in reducing the weight of the pistons and further care to balance them against each other.

Quiet operation is insured by the use of chains for the timing drives to camshaft and electric generator and by an unusual system of valve lubrication. The main

Increased Bore Adds 46 Cubic Inches to Displacement

chain passes around the crankshaft pinion, the camshaft sprocket and also a third pinion which drives the fan and by this latter the tension of the chain is set. From the sectional cut of the motor it can be seen that the fan is mounted on a small spindle which passes through a larger, hollow spindle carrying the sprockets. This large spindle is secured by means of the small studs and nuts shown and also seen in the photograph of the front end of the motor, and it is eccentric in its housing. The flange is slotted at each

bolt hole, so that the distance between centers is easy to adjust and to lock. It is from the second pinion on the crankshaft that the generator is driven and the second pinion on the fan spindle can be employed for a magneto drive. In the ordinary way a magneto is not used, but some of the foreign markets still demand it and this is a simple and



Transverse section through Hupmobile motor, showing characteristic air intake on carburetor

effective way of providing a drive, should this be required.

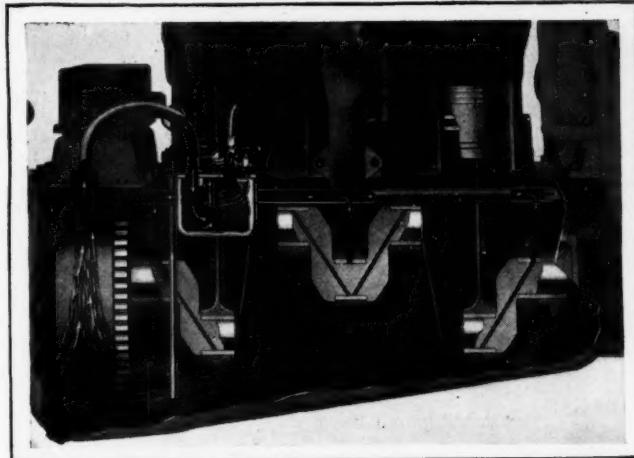
For America the ignition is cared for by an Atwater Kent system driven by skew gear from the front end of the cam-shaft.

There is a separate adjustment for the generator chain so the whole of the front end motor system is well cared for.

Unique Lubrication System

Probably the Hupmobile is the only car using a drilled crankshaft without an oil pump to force lubricant through it, but though there is no pump a fair oil pressure is obtained. Oil is picked up by the flywheel and flung into a bell mouthed pipe which conducts it to a screening chamber. Thence it flows into a pipe cast in the crankcase, is distributed to the main bearings, and through the holes in the crankshaft to the lower end bearings. Oil also goes to the chains and a separate small lead supplies the valve chamber, the cover thereof being oil tight, and it only returns to the base when it has reached a set level around the tappets. This keeps the valve mechanism in a continuous bath of lubricant which prevents wear and also deadens the small sounds inseparable from a poppet valve system.

Thermo-syphon cooling is used. The carburetor is a Zenith and is mounted so that air enters through the aluminum pipe shown in the photographs. In this is fitted a valve, controllable from the dashboard so that cold air can be given, direct from the atmosphere, or else air can be drawn in from the opposite side of the motor whence it has to pass between the hot cylinders. All intake passages are cast integral with the cylinders, but the exhaust manifold is separate. It is of unusual design, having the outlet at the center, being, in fact, more like an intake manifold. None the less it gives a very

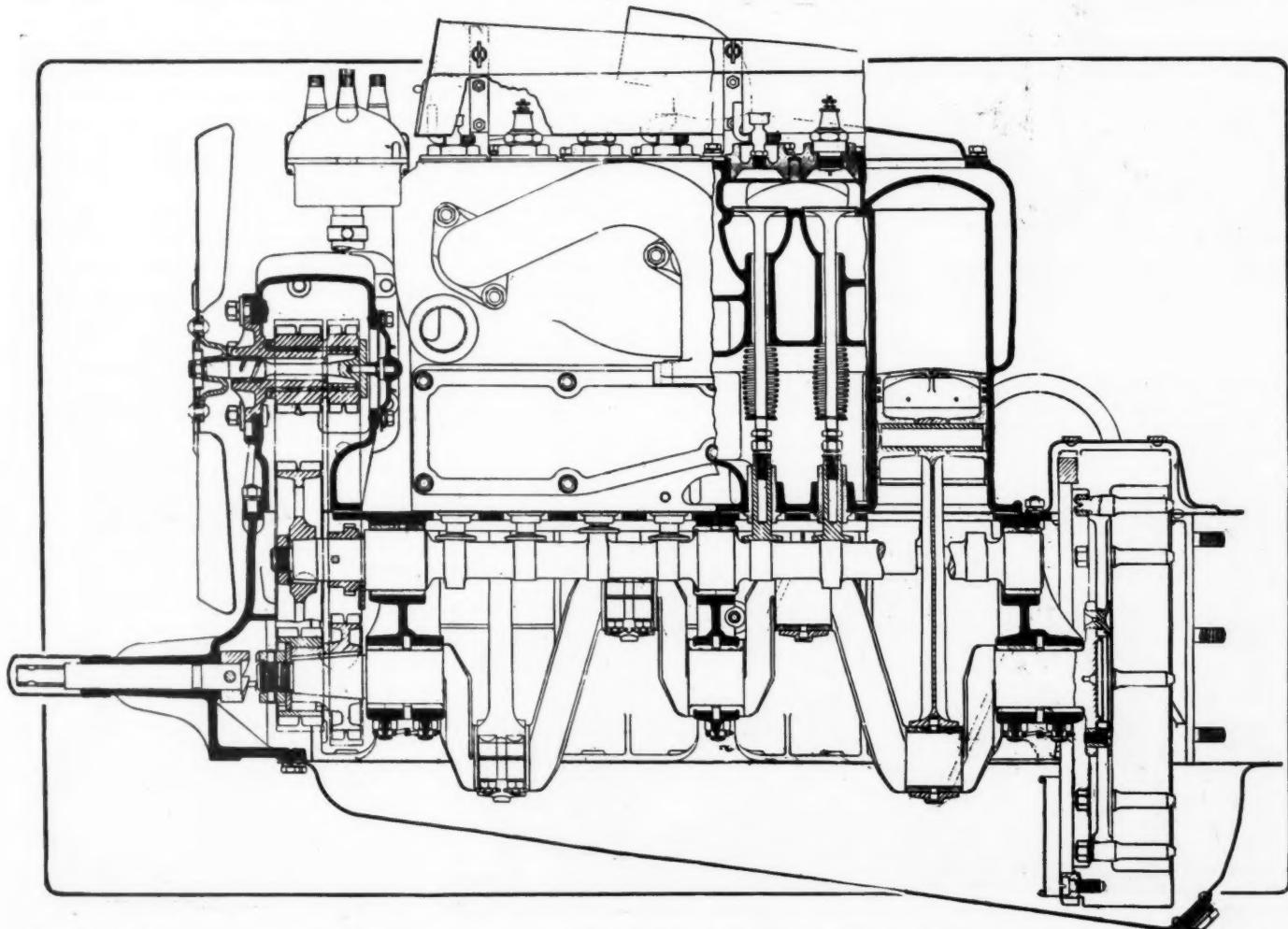


Section through Hupmobile crankcase, showing the general scheme employed in the lubricating system

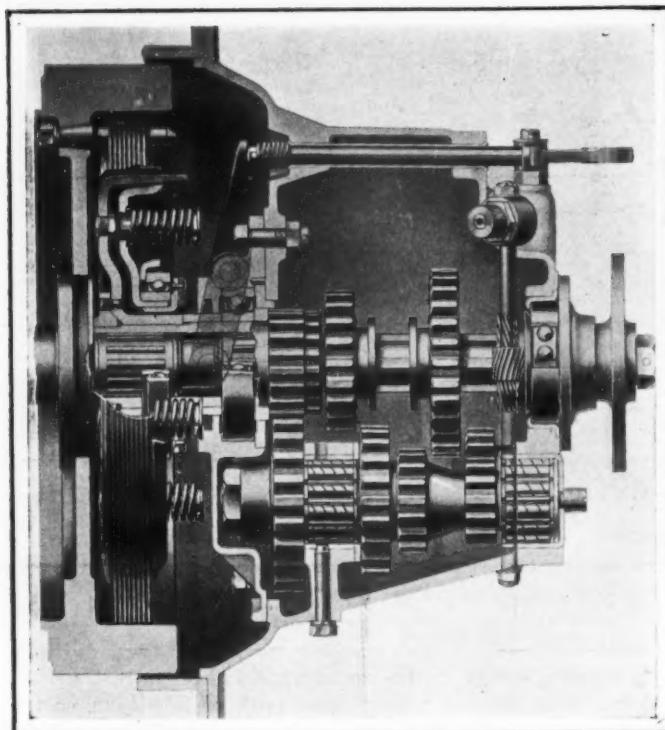
free outflow and enables the muffler pipe to be kept well away from the footboards in the driver's compartment.

Gearbox Most Compact

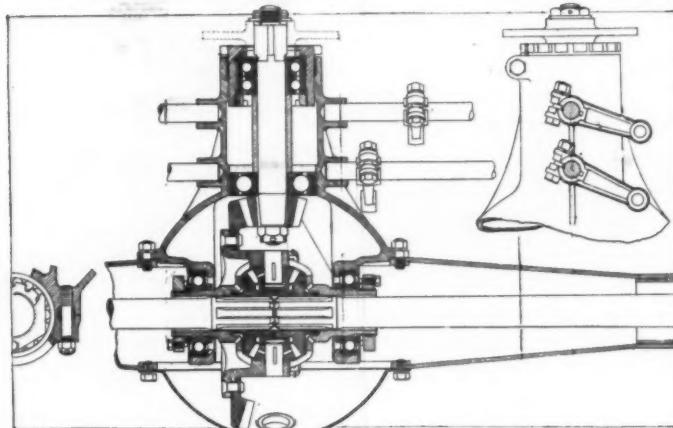
Naturally, owing to the use of the flywheel to pick up oil, the clutch is assured a continuous bath of lubricant, so the steel-to-steel type is used with fifteen plates. It is made up as a transmission assembly and pressure is obtained from a number of small springs instead of one heavy spring. An interesting feature is the arrangement of bearings which can be studied in the sectional view on page 984. Two large ball



Longitudinal section through 1916 Hupmobile motor. Dotted lines indicate arrangement of chains at front of motor. Note strong crankshaft



Section through gearset and clutch, with bearings and cross shaft for speedometer drive



Center of rear axle, showing method of detaching differential and bearing mountings. The thrust of the crown wheel is taken by the bearing on the right of the differential

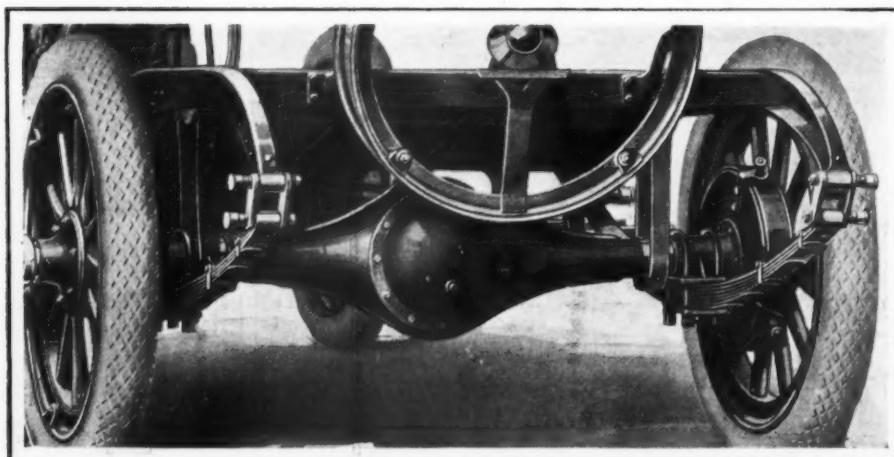
bearings carry the first motion pinion and this is on a hollow shaft containing the plain roller spigot bearings. A large ball bearing is again used at the rear end, and the counter-shaft is on Hyatt roller bearings. A slight change in design not shown in this illustration, but to be found on the 1916 chassis, is that the center portion of the universal is now an integral part of the gearshaft which does away with the keyed-on flange shown. The gears and their shafts are made in as few pieces as possible so as to save weight and space, the result being a small and light gearset. It may be noticed that there is no gearshifting apparatus on the gearbox itself, which is due to the fact that the lever with the brake lever and all the gearshifting mechanism is mounted on the frame and comes to the final assembly as unit therewith. For connection to the internal gearshifters there are a couple of adjustable links, so the use of a separate lever mounting adds no complication to manufacture. What it most noticeably does do is to bring the levers into a much better position for the driver than is to be found on many other cars with central control. Since great rigidity is not needed for a gearset and the casting is smaller in length, weight is saved by using aluminum for the gearbox instead of cast iron.

Removable Differential

For the rear axle a pressed steel main member is used, with all gearing and bearings mounted in a readily removable center casting. The section at the left shows how easily all the mechanism can be removed and calls for no explanation. A point liable to escape notice is that the thrust of the crown wheel is taken by the double purpose bearing on the right side, not by the bearing behind it. This makes the difference that there is then no necessity to hold the outside parts of the bearings which can consequently be just slipped into place. Adjustment for depth of mesh of the bevel gears can be made on the center part of the axle before it is put into the pressed part, and a moment's study will show how greatly this construction simplifies the assembly. Four pinions are used in the differential and the teeth are large, insuring durability. The brakework follows standard lines, the layout being shown in the chassis plan, which also gives a good view of the two-jointed propeller shaft.

Following last year's innovation, the rear springs are underhung beneath the axle, and they take the drive and torque. On the long chassis of 134-inch wheelbase the rear springs are 60-inch and the front 39-inch while on the short chassis of 119-inch wheelbase the front springs are 2 inches shorter and the rear springs 52 inches long.

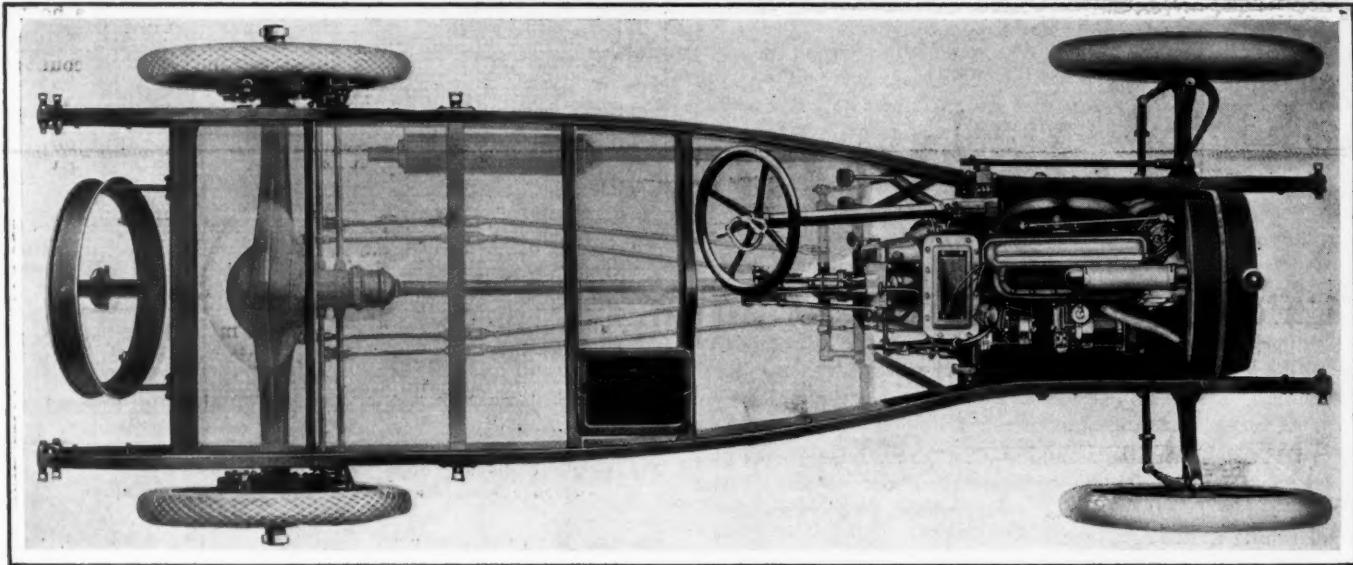
Straight connections and large bearings characterize the steering gear and a special point is the great strength of the swivel arm. It is usual to pierce the swivel pin with a conical



Rear end of 1916 Hupmobile chassis. Note underslung springs



New type windshield on 1916 Hupmobile



Plan view of 1916 Hupmobile chassis, showing tapered frame, layout of brake connections, etc. Note numerous grease cups

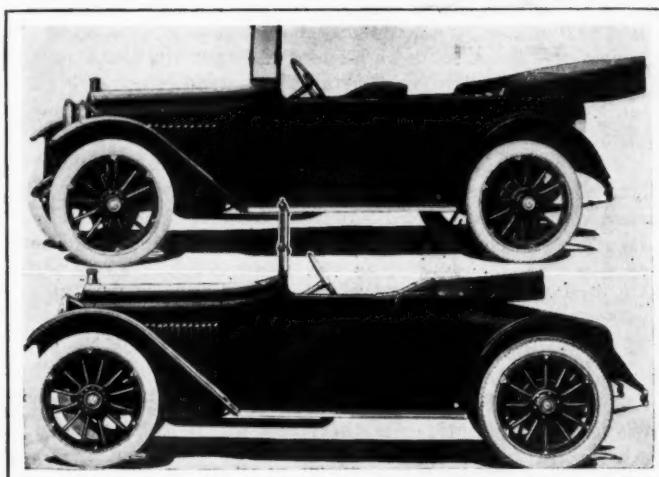
hole and to have a two-branched drop forging to which the tie rod end and the ball joint of the drag link are attached. On the Hupmobile the forging for the linkage is pierced instead of the swivel and it is machined with a central ring that embraces the swivel and is secured by a large nut. This makes the actual drop forging much easier and the resulting parts are stronger than usual.

Standard tires for both chassis are 34 by 4. For limousine or sedan bodies 35 by 4 1-2 are used and the gearing is dropped from 4 to 1 down to 4.25 to 1. Non-skid type tires are always fitted to rear wheels.

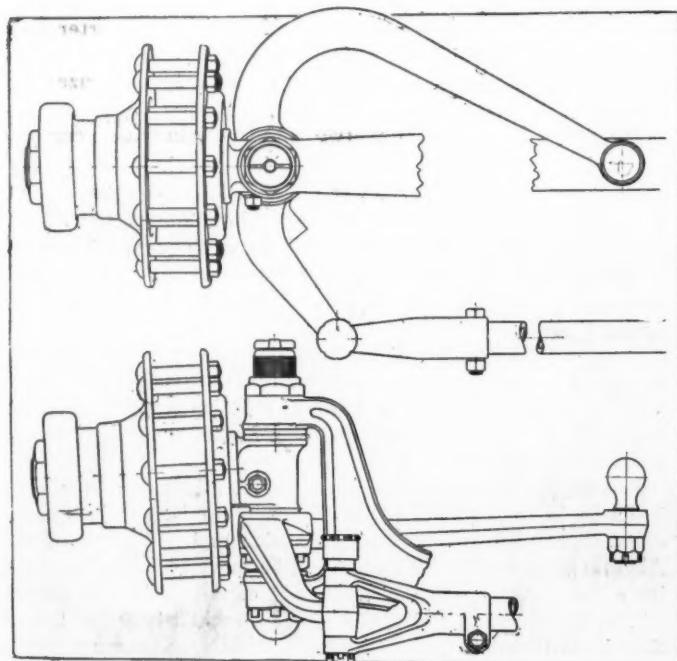
Low Seating Features Body

In the roadster and touring bodies both front and rear seats are placed low, so as to give an easy position for the passengers, and the back of each cushion is much lower than the front so there is a good rake which prevents the passengers from being thrown forward by an exceptional road

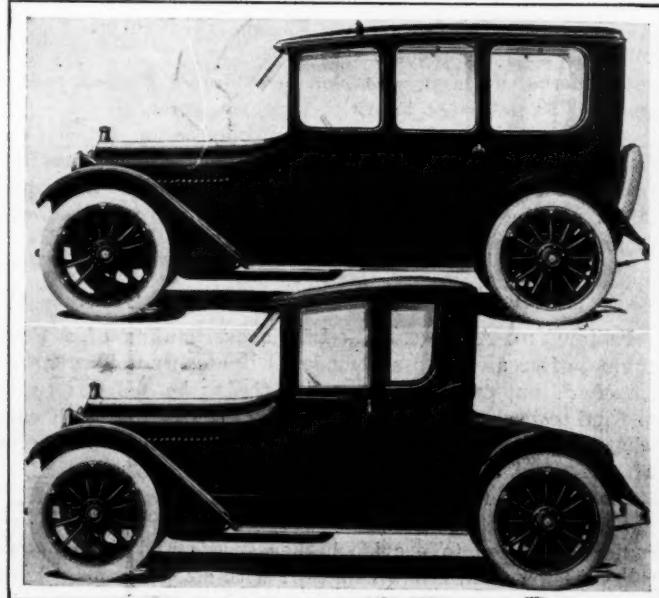
(Continued on page 993)



Upper—Five-passenger automobile touring car which sells for \$1,085 with complete equipment. This car was formerly listed \$1,200
Lower—Hupmobile 1916 roadster which sells for \$1,085



Strong arrangement of steering and tie rod arms on Hupmobile



Above—1916 Hupmobile sedan. Below—The coupé model

The Rosstrum

Calculating Compression on Racing Motors

EDITOR THE AUTOMOBILE:—Can you advise me of the method or formula of calculating the volume of the compression space for a high-speed, four valve-in-the-head racing motor?

2—Also the valve timing of the Peugeot racing motors.

3—Would like to know the amount of compression usually favored by racing motor designers.

San Francisco, Cal.

P. HAWKINS.

—The method of calculating the necessary volume of the compression space for a high-speed motor is the same as that for calculating any other. After the desired compression has been settled upon, it is entirely a matter of making the volume occupied by the gases at the bottom of the intake stroke bear a certain relation to the volume occupied by them at maximum compression or at the top of the compression stroke. Stated in another manner, the relation between piston displacement plus compression volume and compression volume, determines the compression. To put this in the form of a formula, the compression depends upon the relation of $\frac{V + V'}{V'}$; Where V is the piston displacement and V' is the volume of the combustion chamber.

As compressed in the gas engine cylinder, the charge follows neither adiabatic or isothermal laws but falls somewhere between the two according to the amount of heat which is radiated. In other words the expression for pressure is somewhere between $P = P' \left(\frac{V + V'}{V'} \right)^{1.405}$ and $P = P' \left(\frac{V + V'}{V'} \right)$:

where P is the compression pressure and P' the initial pressure. For all practical results the compression pressure as estimated on the accompanied curve, Fig. 1 will give accurate results.

2—The valve timing differs on the different Peugeot racers and you do not state to which type you refer.

3—Racing motor designers favor compression which runs very close to the 100-pound mark. A mechanical compression ratio of 5 to 1 is quite frequent. As estimated on published tables covering this point, the compression will vary between 80 and 121 pounds for this amount.

Steeper Cams on Ford Give More Speed

Editor THE AUTOMOBILE:—In the overhauling of a Ford engine, after all parts are made as light as possible, larger manifolds put on, could the valve timing be changed so as to further increase the speed of this engine? In case it can, what timing would you recommend? Also what is the valve lift? Should the compression be changed?

Clay Center, Kans.

G. L.

—Probably the only way in which a change in the timing could be effected to provide higher speeds and more power would be to put in a new camshaft with steeper cams. As it is now, the cams which you have are designed for quietness as well as speed. If you wanted to sacrifice the quietness by

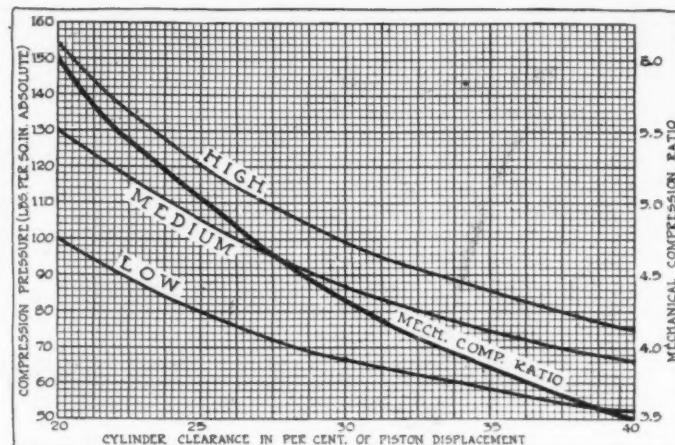


Fig. 1—Curve showing high, low and medium compression for different compression ratios and cylinder clearances

the use of an extremely flat cam, this could be done and there is no doubt that you could secure more power and speed. At the present time the valve lift is .25-inch and this is ample as it permits of sufficient opening for any gas speeds which you are apt to work with. The compression need not be changed.

Platinum Points Vary in Composition

Editor THE AUTOMOBILE:—Have the different makes of magnetos different material for breaker points than platinum? If so, what is it?

2—Are there different grades of platinum points?

Thomasboro, Ill.

FIEDLER BROS.

—The so-called platinum points for magnetos vary greatly in composition and hardness. Different compositions and percentages of iridium are used in the compositions, the average being somewhere about 15 per cent. iridium or less. In some of the very cheap grades no platinum at all is used, nickel being substituted. These points do not stand up for any length of time.

2—Where platinum is used the only difference in actual grade is in the variation of the percentages of alloying substances used and also in the thickness of the points. In some cases the platinum is very thin.

Preheating Necessary with Present Fuel

Editor THE AUTOMOBILE:—Of two motors exactly alike running with wide open throttles, No. 1 is fed hot mixture through waterjacketed manifold and carburetor, also hot air is used. No. 2 motor is fed mixture through manifold and carburetor which is not waterjacketed, but the carburetor is so much better than that of No. 1 motor that both motors receive equally good mixtures, the only difference being in temperature of the mixture;—the temperature of the cylinders of both motors being kept at a fixed heat by the cooling system.

A says that No. 1 will produce more power—not speed—because its mixture, being already hot, will produce a greater number of heat units when ignited; that is, as much more as the heat of No. 1 mixture exceeds the heat of mixture No. 2 before they were ignited.

B says that it is good to compress the mixture, but to heat it as little as possible while compressing it, so that more expansion will take place after ignition and less of it before. Also he says that No. 2 motor will be more powerful because its mixture not being heated, is not expanded to the extent of No. 1, therefore, more of it will be sucked into No. 2 and that it will have greater expansion, heat and pressure after it is ignited; owing to the fact that it was less expanded before it was ignited. B says to compress the mixture to a

high pressure and keep it cool as possible while doing so. A says greater heat and therefore power is secured if the mixture is heated previous to ignition. Can you kindly tell me who is correct in this?

Tampa, Fla.

CONSTANT READER.

The only reason that we preheat fuel is to thoroughly vaporize it. In other words, for a given volume and a given mixture, a greater amount of heat units will be contained in the cooler charge. The reason for this is that the heat expands the charge thereby permitting a smaller number of units of fuel to be contained in a given volume. The fact that some of the heat units which would ordinarily be lost are returned to actual use by preheating the charge is a factor in the situation and does reduce the difference between the two conditions, but it is doubtful if as many heat units would be given up in this manner as would be lost by having a preheated charge. The practical side of the question, however, is one which must be looked upon. With the gasoline that we are now getting it is necessary to use heated air if the best results are to be attained; otherwise, the fuel will not be vaporized, especially during cold weather.

Timing for Two-Cylinder Opposed Motor

Editor THE AUTOMOBILE:—Will you kindly publish in THE AUTOMOBILE information on the following subject: What valve timing should one use on a two-cylinder opposed truck motor with a bore of 4 1/4 and a stroke of 4 1/2?

Chicago, Ill.

ART JACOBS.

Since the valve timing which will give ideal results for any given motor is a variable quantity and depends largely upon such details as manifold design, the only thing which can be done is to give you an approximate timing from which you can vary in one direction or the other until you attain the best results.

If the cams are already made and in the motor, you can only place them so that the valve openings will correspond with those given and allow the closing to take care of itself. A fairly average timing which should give good results is as follows: Intake valve opens 10 degrees after upper dead center, and closes 35 degrees past lower dead center. The exhaust valve opens 40 degrees before lower center and closes 5 degrees past upper center.

Timing on Knight Type Motors

Editor THE AUTOMOBILE:—Does the A. A. A. have charge of all contests in this country and if they do can you inform me where to write to find out the rules governing these contests?

2—Will you give me the complete timing of a Stearns-Knight motor, including the magneto timing?

3—Is the magneto timing on a Knight motor the same as on poppet valve motor? If it is not the same, what is the reason for it?

4—What is the setting of a magneto on racing cars in general?

5—Explain the oiling system on the 1915 small Stearns-Knight motor.

Yonkers, N. Y.

W. E. D.

The A. A. A., or American Automobile Assn., has charge of the automobile contests in this country in the same manner as the A. A. U. or Amateur Athletic Union has charge of the athletic contests. It is the organization which sanctions the races and under whose rules the contests are held. You can get all these rules from the American Automobile Assn., 437 Fifth avenue, New York City, by addressing the contest department.

2—The timing on the Stearns-Knight motors models SK 4 and SK 6 are: inlet valve opens 4 degrees past top center, inlet closes 40 degrees past bottom center, exhaust opens 60 degrees before bottom center and closes at top center. The

magneto is set so that full retard occurs on upper dead center.

3—The timing of the Knight cars is very much the same as on poppet-valve cars.

4—In general, the timing for a racing motor is advanced from one to two teeth on the timing gears ahead of touring practice. The exact number of degrees of advance will depend upon the make of magneto and hence no definite rule can be laid down for this, but where it is common touring practice to have the full retard occur on upper center in a racing motor, the full retard position will be advanced one or two teeth on the timing gear.

5—The arrangement of the oiling mechanism is shown in the sectional view of the motor, Fig. 2. The crankcase forms the oil reservoir and this is filled through the breather pipe located at the front end of the motor. An oil pump is located at the front end of the eccentric shaft. The oil in the case passes through a screen into the pump and through a filter screen A through pipes leading to the crankshaft bearing, pumpshaft bearing, chains and thence to the connecting-rod bearings by means of a drilled crankshaft. The oil passing through the crankshaft feeds the connecting-rod bearing and the surplus oil is picked up by the hollow connecting-rod and delivered to the hollow gudgeon pin that is so drilled as to deliver oil to the piston bosses and lubricate this bearing.

The end of the gudgeon pin is plugged by means of a brass expanding patent washer that has a small hole drilled in its center; this hole permits enough oil to pass through it to supply lubrication for the piston. There are also three holes in the lower part of the connecting-rod that allow enough oil to escape to amply lubricate the sleeves. In order to assure the operator that the oiling system is working properly at all times there is a gauge located on the left side of the cowboard denoting the oil pressure. This gauge should read from 1 to 5 pounds, approximately, when the throttle is closed, and the motor is idling, or under very light load, and should read from 40 to 60 pounds when the throttle is wide open and the car running at normal or high speed. This gauge denotes the pressure of oil on the main bearings and it is essential that the gauge read as described. Its failure to do this is caused generally by a clogged screen and sometimes by a leak in the pipe or connections. A leak on the suction side of the pump will suck air and a bearing is apt to burn out unless this receives attention.

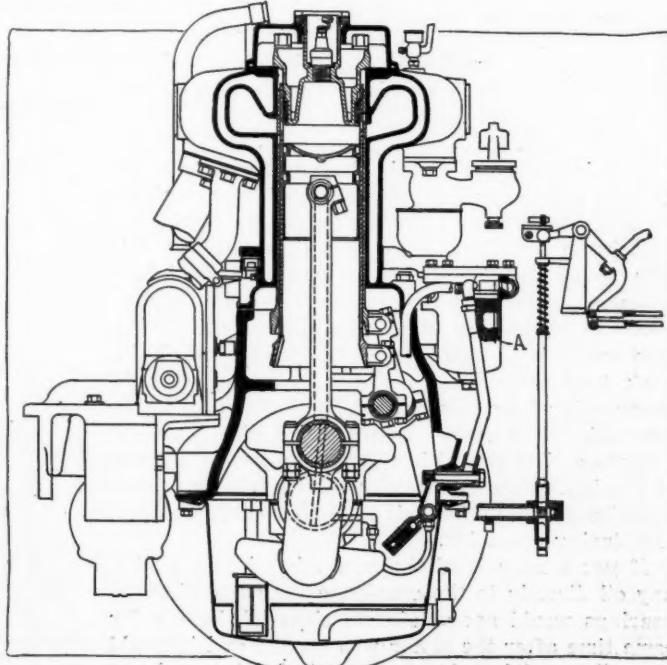


Fig. 2—Sectional view of the Knight engine as made by the Stearns company.

The variation in pressure as shown on the gauge is controlled almost entirely by a by-pass on the main oil lead, which is directly connected to the throttle control mechanism. This by-pass consists of a main body and a piston or plunger. A port in this by-pass body registers with a series of holes in its piston when the throttle is closed, or in the idling position, and permits the oil to pass through freely, relieving the pressure on the bearings and eliminating the possibility of smoking.

An adjustment of this by-pass valve is furnished to regulate the pressure in the idling position of the throttle and is operated by a small blade rotating from the center to right or left. This adjustment is locked by means of a clamp bolt. When the throttle is opened the piston or plunger is raised in proportion so that the holes in this plunger cease to register with the port in the body and the blind extension of the plunger seals the port of the by-pass body. This forces all the oil through the bearings and the pressure is then controlled by the speed of the motor. A safety valve is located inside the crankcase on the main oil line and is regulated at the factory for the maximum pressure.

Oil Reservoir Could Not Have Been Filled

Editor THE AUTOMOBILE:—I have recently had the motor of my 30 horsepower Buick car overhauled, new rings put in and a general tightening up. Also had the oiling system looked over. The garage men say they ran the motor and looked for possible leaks; took it out and later delivered it to me and received their money. I took the car out with one gallon of oil in the base—3-4 gallon puts it up to the petcock—smoking well at the exhaust, and had only gone about 10 miles when the motor began to knock. I stopped to make an examination, and found the petcock closed, hard to turn by hand and no signs of a leak. I put in another quart of oil and turned the engine over, but the knock was still there. I phoned the garage and was towed in. The motor was taken down again and the connecting-rod bearings were found to be burned out. The man said that there was but 2 quarts of oil in the base, including the quart of oil which I put in when I stopped, and that the petcock must have been opened and closed again.

What became of the other 3 quarts of oil inside of 10 miles? If there was only 1 quart of oil in the base, would not the bearings get sufficient to prevent burning?

What in your opinion, caused this trouble? The men at the garage say that it was not their fault, while I claim that they have failed to do their work properly. Would greatly appreciate your opinion on this.

Weehawken, N. J.

GEO. F. TUTTLE.

—It is not quite certain from your letter which model you refer to but presuming that you mean the model 30 which was built during the year 1913 this model has an oiling system such as illustrated in Fig. 3, and Fig. 4. A plunger pump draws oil from a separate reservoir and forces it through a sight feed on the dash to the center crankshaft bearing. The excess is thrown off from the crank and drains back down the sides of the case into troughs in the lower half of the crankcase. The lower ends of the connecting-rods carry dippers which dip into these troughs and as the oil is splashed up by the dippers, it gradually works its way forward. The pump supplies only sufficient oil to replace that which is lost during operation.

If you merely filled the reservoir without adding any oil directly to the crankcase the connecting-rod bearings would not obtain sufficient lubrication for some time after the motor was started and it would be easily possible to burn out a set of tight new bearings in this manner. Or, if there was insufficient oil in the crankcase and the stroke of the plunger pump

had been cut down too much the motor would soon use up this oil in the crankcase and would not receive any from the reservoir.

However, since you state the motor smoked, it was evident that there was sufficient oil in the crankcase. With this amount, certainly should run 10 miles without giving trouble. On the other hand, were any oil put into the reservoir it should be there when the motor stopped if you had only run 10 miles, as you state that no leak was apparent. It would be easily possible for an inexperienced driver to burn out a set of newly-tightened connecting-rod bearings in that distance, but it is impossible to see how he could have gotten rid of 3 quarts of oil in that time. Referring again to the illustrations, you will see that such a thing is impossible with this model motor.

Cannot Use Six Magneto for a Four

Editor THE AUTOMOBILE:—Please tell me whether I can use a six-cylinder Gianoli magneto for a four-cylinder, four-cycle Premier motor and in what way can I use it with the best results?

Kindly give me a wiring diagram for that purpose.

Clarksburg, W. Va.

BIRGER MALMQUIST.

—It is not practical to use a six-cylinder magneto for a four-cylinder car.

Improper Gear Mesh Causes Noise

Editor THE AUTOMOBILE:—When I run my 1914 Ford at about 20 or 25 miles per hour, it makes a grinding noise as though there is friction somewhere in the transmission system. Above this speed, or below it, the noise disappears. On taking the rear axle apart I found nothing wrong. Is the trouble in the transmission or in some other part of the car? If so, how can I remedy it?

San Antonio, Tex.

FRANK FOSTER.

—Improper meshing of the driveshaft pinion and master gear in all probability is the cause of a noise appearing in the differential when the machine is driven at a speed of 20 or 25 miles an hour. If you will have the driveshaft pinion and master gear replaced the trouble will probably be immediately overcome.

Troubled by a Slipping Disk Clutch

Editor THE AUTOMOBILE:—I have a 1915 Hupmobile, latest model. I have had trouble with slipping of the clutch. Have tried washing it with kerosene but with no results.

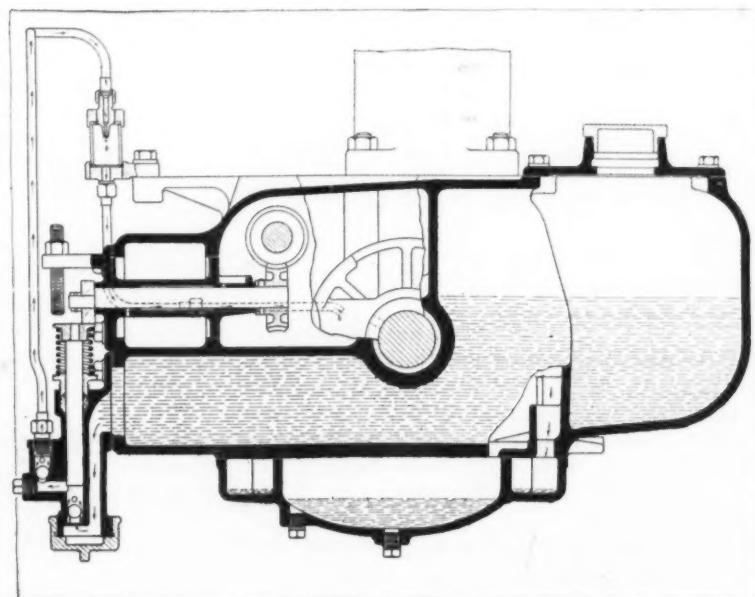


Fig. 3—Transverse section through Buick 30 oil reservoir

Also had the crankcase taken off but see no nuts to take up on like those on the 1913 model. Have tried both kinds of oil but have met with no success. The instruction book states that there are no adjustments.

Ambler, Pa.

—The causes of a slipping clutch on a 1915 Hupmobile are exactly the same as those which would cause any multiple disk clutch to slip and there is no particular weak point in the design of this clutch which can be picked out as the cause of the trouble. Probably the clutch is being held disengaged by the sticking of the pedal shaft in its bearing, or other members of the operating mechanism are sticking due to lack of lubrication, thus not allowing the clutch to become fully engaged when the pressure is removed from the clutch pedal. If the mechanism is found to be in good shape, the next cause would be insufficient pressure exerted on the plates. This might be caused by weak clutch springs, or springs that have taken a permanent set after a few thousand miles of service.

Automobile manufacturers can test springs for their tension and while great care is exercised in the strength of the steel wire which goes into them and the heat treatment of the same, nevertheless occasionally springs will pass by inspection, no matter how rigid, that have not been carefully heat treated and after some little service they will make a permanent set and fail to exert sufficient pressure on the plate to transmit the power.

The third, and most likely cause in the Hupmobile, is dirty and gummed plates due to neglecting to change the lubricating oil in the motor.

Needs License to Be a Chauffeur

Editor THE AUTOMOBILE:—If I own and operate my own car for hire, and have my state license, do I have to get a chauffeur's license?

Neoga, Ill.

—Your license to be a chauffeur is entirely independent from the registration of the car. In order to be licensed to carry on the business of a chauffeur, you will have to pay a separate fee and have a regular chauffeur's license which includes a distinguishing number or mark which is assigned to you. To secure the license, you must pass an examination held at a point which is named by the secretary of state and when your application is sent in it is accompanied by the fee and your photograph in accordance with the regulations printed on the blank. The aim of this law is to have every

L. E. DRAKE.

chauffeur in the state registered upon the books of the state authorities and upon those of the county clerk in the county of which the applicant is a resident. You will be provided with a badge after you have secured your license which must be worn in a conspicuous place at all times when you are driving a vehicle for hire.

Savage Car Not Manufactured

Editor THE AUTOMOBILE:—Could you tell us where the Savage car is made?

Oshkosh, Wis.

IMPERIAL MOTOR CAR CO.

—The Savage car is not manufactured. The originators of the company were not long ago arrested for conspiracy to defraud through the mails and although they were not convicted, the idea of manufacturing the car has been abandoned.

Wants Information on W. E. Laboratories

Editor THE AUTOMOBILE:—The Western Electrical Laboratories, Des Moines, Ia., during January of this year sent out a circular letter announcing that they were making blueprints of every Delco system since 1912 to 1915 types that the Delco people were putting out. I wrote them in regard to this and the letters were returned marked unclaimed. They failed to put their street address on their letter. Can any reader of THE AUTOMOBILE give any information about them?

Coalinga, Cal.

F. K. HEINZEN.

—THE AUTOMOBILE has no record of the Western Electrical Laboratories of Des Moines, but probably some of our readers in that territory are acquainted with this organization and will give information concerning it.

Mulford's Lozier Was a Four-Cylinder

Editor THE AUTOMOBILE:—Will you kindly advise me whether or not the Lozier car driven by Ralph Mulford in the 1911 Indianapolis race was a four- or a six-cylinder car?

2—Is there an agency in this country for the Hispano-Suiza car?

Cleveland, O.

R. MERRIAN.

—The Lozier driven by Ralph Mulford in the 1911 Indianapolis race was a four-cylinder car, although the race was won by a Marmon six.

2—There is no agency in this country for the Hispano-Suiza car.

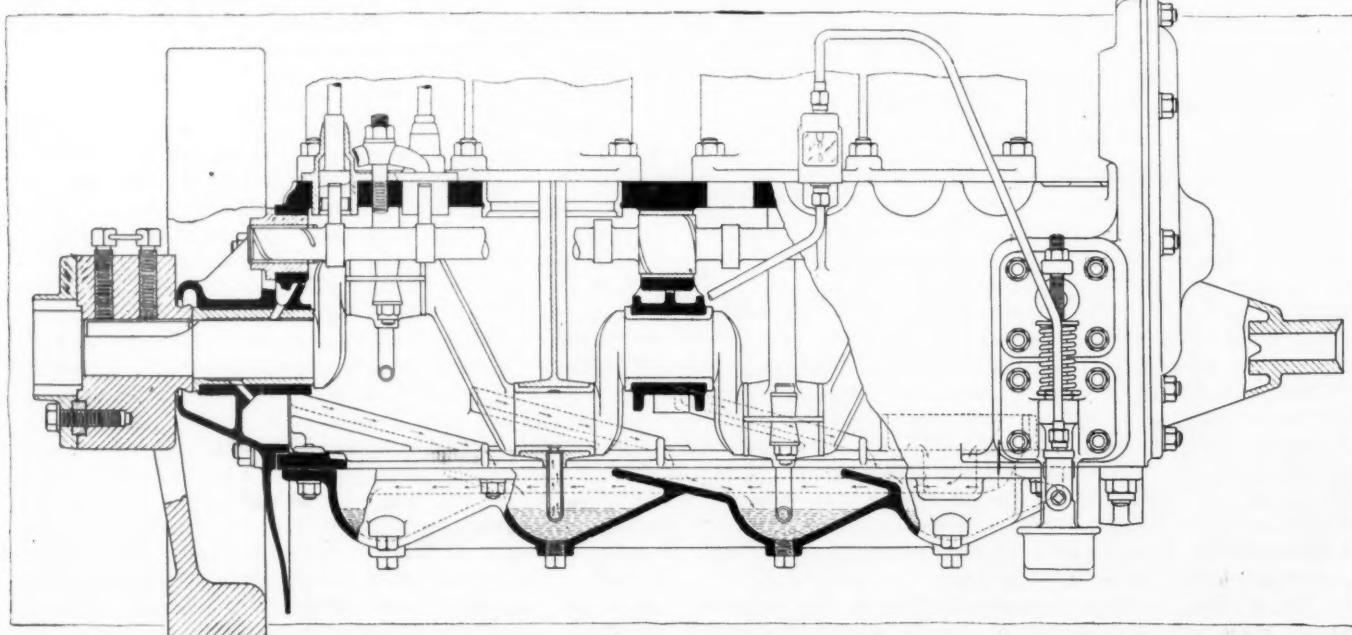


Fig. 4—Longitudinal section through the Buick 30 crankcase showing oiling system

Ungenerous Spring Capacity, Useless Spring Movements and Horizontal Rigidity Chief Faults to Be Remedied

(The Improvement of Spring Systems—XIV)

By M. C. K.

WITH the advent of the "silly season," during which the magnetism of theory seems neutralized by the attractions of outdoors, and with the stirring events of the world tending likewise to distract the mind from the tame technical upbuilding of comfort, safety and economy for motor vehicle users, there will be a pause in this series of articles after the present issue, the thread to be picked up later, D.V., as soon as the writer shall have gathered a set of graphic records of the effects of road shocks to illustrate his conclusions, especially those points which mere theorizing leaves in doubt on account of the complication of spring action with the action of more or less elastic tires whose physical properties are indeterminate or unknown. These points, as some readers are aware, relate mainly to the question what the exact movements and shock forces of vehicle bodies and running-gears must be and are under a number of different and representative road and vehicle conditions when a spring suspension of suitable flexibility and working capacity is supplemented with a device, such as the "bob check" briefly described in articles XI and XII, which returns the spring elements to their equilibrium after each shock with a minimum of delay—the delay, or moderation of the checking action, being subject to regulation through adjustment of the device. It is known that these movements and shocks are frequently disagreeable and destructive with only the average spring suspension to tone them down and that the unsystematic search for improvement through scattered individual efforts is leading to a costly and wasteful diversification in construction which must sooner or later be stopped, under the compulsion of competition, while at present the burden of finding a suitable solution of the difficulties for each vehicle rests very largely on its owner, the manufacturer supplying only a plain leaf spring suspension.

Two Compromise Methods

The method which has been developed in practice to meet this situation has in the past few years passed from one stage to another. At first, the aim was usually to make springs flexible enough and to help them sustain shocks by means of shock dampers or absorbers of different sort and value, none of them load-sustaining. For the higher-priced cars this still remains the rule, and the most ambitious makers provide springs so large that, in conjunction with bumpers and rebound straps, the equipment meets most requirements, excepting overload capacity. But the general industrial tendency has during the last 2-3 years turned toward supplying the market with a great variety of so-called shock absorbers which are in reality auxiliary coil springs and whose main function is that of supplying the flexibility which the original spring equipment is lacking. As compared with the first method there is a saving both in the cost of the springs and in that of the devices, and the development is logical enough, so far as it goes, for cars

not intended to be driven at high speed or on rough roads, that is, for a modicum of comfort and safety. The mobility or rapid oscillation of an unfettered coil spring is also looked upon as desirable, to enable the car to glide over the small inequalities of good roads without vibration or wavy motion of the car body, but no data have been brought out to uphold very decidedly this contention, which amounts to a claim that the action of a short and stiff leaf spring plus an auxiliary coil spring is superior to that of a leaf spring of equivalent flexibility. In some instances the coil springs are in fact made to operate with considerable friction to slow up their oscillations.

What is "Good Enough"?

(The writer is told, occasionally, that nobody suffers intensely for lack of spring improvements and that the whole development will take care of itself very nicely; "all people have to do is to drive with care and moderation, and they can then get along with what they have without any further innovations and without being told that something more perfect is possible, much less having it pointed out to them with fervor." The answer is, perhaps, that an improvement should in fact have economical force to fit itself into a development without destroying acceptable existing values, being adopted first where it proves itself most needed or desired—as the motor vehicle itself has done—and that there is an abundant opening for an improved spring system in the thousands of pleasure cars and commercial vehicles which are built on new designs every year, designs in which room can be made for improvement with economy for the maker as well as for the prospective users of the vehicles.)

Limited Virtues

The useful coil spring stroke is rarely more than $1\frac{1}{2}$ inch and cannot be longer when the coil is applied at one end of a half-elliptic. This range makes $\frac{3}{4}$ inch for the axle, and if the leaf spring is twice as stiff, hereto comes a simultaneous leaf spring compression of $\frac{3}{4}$ inch, making the total range for which additional flexibility is gained $1\frac{1}{2}$ inch, or the same as the coil spring stroke alone. For cross springs the device is more effective, giving the benefit of its full stroke plus that of the leaf spring. Correctly mounted (under forced tension equal to minimum load) the coil spring reduces the rebound, and not a few of them are so mounted, but for overloads they increase the rebound. In all cases practical difficulties have to be overcome to make the attachments strong enough and wear-enduring as well as rigid laterally, and, as the load must be carried on the auxiliary springs, these must be wound very openly and they must be very accurately calculated, made and heat-treated in order to have a predetermined range of action after being compressed by the static load. Their possible range scarcely renders it practicable to have the auxiliary springs useful

for carrying the normal full load as well as the empty vehicle with the desirable flexibility, except in vehicles whose load is only a small percentage of the vehicle weight. The application to commercial vehicles is therefore limited, and in the application to pleasure cars the drawback remains that the other end of the leaf spring action—that relating to overloads and severe shocks—is not affected by them, so that the leaf springs, to take care of these extremes, must still be made relatively long and heavy with a considerable range of stroke of their own or else must be supplemented by overload springs, while the need of real shock absorber or spring damper action also remains nearly the same as if the auxiliary springs were not employed.

Compromise and Multiplicity

Auxiliary coil springs, after some wear has taken place, usually result in a certain lateral looseness in the suspension against which special precautions must be adopted, and in those cases a spring damper of such construction as to neutralize the looseness is found preferable over other dampers which do not possess that feature. The choice of a damper is also affected by the leaf spring dimensions, as these may be selected with main reference to comfort in ordinary travel on ordinary roads or with main reference to safety at high speed and on wretched roads. On the whole, so long as compromises are the rule and can be made in one or another direction, the development runs irresistibly toward a great multiplicity of forms and manufacture in spring devices, and the perplexed owner, to whom the final decision in his own case is left, with a few adjustments thrown into the bargain for him to attend to, arrives eventually at the conclusion that, pending the coming of better things which the car manufacturer will provide of his own accord, he can get along without any spring accessories if he drives carefully and uses oversize tires, under-inflated, paying the bills as cheerfully as he may.

An Overworked Advantage

With regard to his commercial vehicles whose suspension is far more imperfect—on account of large load variations, unmitigated horizontal shocks and the greater emphasis on economy in their construction, especially in their spring dimensions and quality—he consoles himself with the fact that these badly sprung vehicles, despite the vibrations and the rough jolts which they deal to drivers and loads and to their own structures, pay handsomely for themselves, all repair bills included, through one factor alone, which is the extension of business zone and business volume made possible by them, and which could not be accomplished by any other means at common disposal or representing a comparable investment. Perhaps he also observes that it is only in those lines of business in which a long radius for the transportation work serves decidedly to extend business volume that the economy or profit in using motor vehicles is undisputed, but in this observation he is less interested than the members of the motor vehicle industry, and these are slowly beginning to realize that the upkeep expense, which is the only thing that limits the sale of commercial motor vehicles, is decided in greater degree by the quality of the spring suspension than by that of the roads. A bad road jolts sense into the driver, but a bad spring suspension shakes it out of him.

What Improvements Pay Best?

The "volume of business" has carried the motor truck business over many pitfalls, and now a war in which economy is not scrutinized is an additional lucky factor for the moment, but eventually the economical question is one of motor truck against motor truck or against horses for the short haul as well as for the long one, for the rough one as well as for that over smooth and hard roads, and, then, the economical shortcoming which it will pay best to remedy is

the one which is most universal and yet least recognized and the remedying of which will appeal most directly—through the senses and through the repair bills—to the drivers and owners. It happens that the spring system is also the feature in construction of which the faults can most readily be pointed out and that these very definite faults can be removed without any other difficulty than the mental one of parting with a few accustomed notions and without increased cost of vehicle production. From certain communications from readers, however, it is learned that the lines of reasoning followed in previous articles is looked upon, here and there, as being theoretical and therefore inconclusive—more so than vague generalizations at the fringe of the subject—yet it is generally admitted that it should be possible and practicable to improve present results and reduce upkeep cost. With a view to these opinions some general and informal remarks may be in order, to summarize in a fashion the reasoning previously presented.

Handicapped Accessory Designers

If a system of construction has faults, or features which plainly counteract its purpose, the rational way to improvement is to remove these faults first and strive for further refinements afterwards. This can perhaps be taken for granted. The first natural question is therefore: "What is the fault of the present spring system?" The general answer is: "It is a stingy system. It does not give enough. It is a system for horse vehicles. The users cannot improve it radically by means of accessories, because there is not enough spring in it to begin with, for the work motor vehicles must do." Accessory devices are handicapped by having to supply the missing spring capacity, in some form of friction, as well as providing the regulation of movements. This combination of purposes does not work out for all cases. It would be a miracle if it did, as the shocks and the movements do not come at the same time and some movement is necessary.

Generous with One Hand Only

Anent the stint. In the matter of power, the user needs 3 or 4 horsepower for his average work, and the automobile industry gives him 20 to 40, so that he may climb hills at any speed he wants and may have ample chances for pulling his truck load out of the mire. A single-cylinder motor would do the work, but the industry gives him 4, 6, 8 and 12 cylinders. Where material strength is involved he generally gets an ample factor of safety. He does not like vibration or noise; the industry gives him a vehicle as silent as a cat in daytime and one on which a pencil can stand upright while the motor is running. In all things he gets the good measure appropriate for the generous part which motor vehicles are to take in the scheme of the world. Only the spring suspension is stinted, being best fit for standing still with, but for the air tires; witness the thumping and rumbling of any ordinary motor truck, loaded or unloaded, on asphalt. The system is calculated for static loads, yet meant for a vehicle whose shock loads are the important ones. It has to have bumpers to prevent collapse, if it is made for comfort. It has a 4-inch stroke though one of 8 or 9 inches is wanted two or three times a week, if it is made mainly for protection. It has to have flexibility added at one end and reinforcements at the other, if the compromise is made in favor of the middle range. It is intrinsically fit for its average work only, with scarcely a smidge to spare for emergencies. The devices added to it, usually by the vehicle owner, to enable it to withstand these very normal emergencies, may save the integrity of the spring but they do not make it perform additional spring service; that is, they absorb some shock forces but not so dependably as could be done if the spring were built for the emergency, nor so rapidly as to get it ready for a fresh shock the next moment.

With an abundance of spring to start with it would still be advisable to use an auxiliary device for regulation and limiting of movements, but there would be enough spring left for the fresh shock even if the spring were not fully restored to its best position when it occurred.

These difficulties are too complicated for vehicle users to cope with.

First Thing to Do

If this view is correct, essentially, the first thing to do is to provide more spring, and, as a spring of great flexibility is slow and wasteful of movement for severe shocks, while one rigid enough for the latter is inefficient for light shocks, the additional spring capacity should be attuned to meet both conditions. It should economize movement and time by being arranged to take light shocks easily and sharp ones stoutly; it should have progressive resistance to flexion.

Useless Movements

The next thing to do is to remove the most conspicuously irrational feature from the ordinary spring, which is its continued oscillation after each of its working movements. These reciprocations of springs and of vehicle bodies have been associated with spring work and spring duty so long that the great lay mentality, whose hesitations thicken the flow of thought in everybody, shrinks from any radical interference with them, and ascribes mystic virtues to them. Yet it is well known that a perfectly good spring cuts down its series of oscillations to a single stroke when it has no static load to keep it moving. It is also plain that the force required for stopping the spring from wasting its working-time on useless bobbing cannot be greater than, or as great as, that of the shock which produced the first compression, and that it should be possible to get it back from the compression to equilibrium in the same short time it took to compress it (which was the time it took the vehicle to pass over the road obstacle) without experiencing more shock from this action than from the shock itself, or quite as much. And it is known that with a spring of suitable flexibility the shocks that are felt disagreeably are not those sustained when an obstacle is struck with the spring in equilibrium (the first obstacle after a smooth stretch of road) but those which follow and are received by a spring already compressed through continuance of oscillation or already in a motion that prevents it from offering a gradually increasing resistance to the fresh impact. It is a clear inference that best all-around results must be obtained by shocklessly and rapidly stopping the rebound of a spring at the point of its static equilibrium, provided the spring in itself has a full-fledged capacity for absorbing any shock received by it in this position.

The same result is arrived at by considering the movements of the vehicle body rather than the shock forces. These movements are exemplified in the great upward thrust given to the vehicle body when the running-gear strikes an edge separating one road level from another 4 to 5 inches higher. As the wheels cannot get further downward than the new level permits, the spring rebound takes effect upwardly, as everybody knows, and the inertia of the body carries the spring extension, beyond the equilibrium, to an extreme. But the self-contained checking device which prevents body and axle from separating beyond this limit, unless very slowly, while retarding the rebound from its start as much as practicable for the class of vehicle in question, changes the sudden thrust to a gradual rise, as desired.

Preparedness for Shock

Under all conceivable road conditions the absolute stopping of oscillations, by sufficient resistance applied during the spring's return from compression to the position of static equilibrium, supplies the rational condition of preparedness for all eventualities of the road. While it does

not necessarily reduce every shock to its minimum of shock effect or suddenness, it strikes the best average in this respect, and this is the point of importance where it is the extremes that must be avoided. The softness of the cushioning, on the other hand, must be provided by having great capacity and range—carrying-power as well as flexibility, or what in previous articles has been designated as "dynamic flexibility"—in the combination of leaf spring and air spring.

The Best Leaf Springs Alone Will Do

If it were not desirable to provide a suspension able to take care of large load variations, as can best be done by means of a system giving decreasing flexibility for increasing loads and shocks, the necessary capacity and range could in most cases be supplied through leaf springs alone, without getting to unwieldy dimensions and too-slow action, by taking up the almost discarded full-elliptic (which moreover could be made progressive by a suitable modern development of the old scheme of a Cupid's-bow curvature) or by double half-elliptics with many broad and thin leaves. A step in this direction is taken, for example, by the large Express companies, who find it the best plan to shoulder the expense of having broad and rather thin-leaved half-elliptics made of high-priced alloy steels—giving increased safe flexion for a given length—but dare not go far enough in flexibility for two reasons; one being that the vehicles do not allow the range of action for utilizing such increased flexibility and the other that they have not so far succeeded in finding the proper and durable device absolutely necessary for regulating large oscillations.

Considerations of the same nature account for the fact that it is customary to accept a more restricted range of spring action for heavy than for light vehicles, although everybody of course admits that there is the same need of range of movement for gradually absorbing a shock in both classes of vehicles.

Properties of Air Springs under Control

While the manner of applying a combination of a leaf spring with an air spring, to provide a radical and economical remedy for the difficulties mentioned, may be subject to a thousand variations, the principle of utilizing this combination is clear and widely understood. The volume of air used, its tension and the mechanical arrangement by which a sliding scale of axle lifts produces a different sliding scale of compressions of the air—and therefore different resistances—are the factors which can be manipulated to give desirable results. Here, as in the case of unaided leaf springs of unusually large working-capacity, the difficulties which have been experienced in the past have depended mainly upon failure to realize the need of a suitable checking action for the rebound and for regulating the rapidity of oscillation, while appropriate and dependable means for obviating leakage of the air have also been missing. The system of maintaining the air pressure by a constant pumping action, as done with the Westinghouse system of air springs for vehicles, has now been proved adequate for overcoming this practical objection, and the diaphragm system—as it is termed in other lines—for operating a liquid piston against air imprisoned in a completely impervious metallic container, as outlined in these articles before, is so close a parallel to methods used for vacuum pumps and in other industrial applications that no question of its soundness can arise, but only that of fitting an air spring of this nature into a vehicle frame in an acceptable manner. The road to fundamental improvement is thus clear. It requires only to be traveled.

Possibilities for Racing Cars

To go still farther in the arrangements and undertake, for example, to utilize each road shock for propulsion, as

conceivably may be done, would be to go beyond the fundamentals and into special refinements. The combination of a leaf spring and an air spring supplies, however, a possibility in this direction—which might be useful for racing cars—as pressure on the air spring could be applied propulsively, if desired.

Horizontal Shock Absorption and Vibration

But, aside from (1) stinted working-capacity and (2) continued oscillation, there is a third fundamental shortcoming in ordinary springing to be remedied. This is (3) rigidity to the horizontal component of shock forces. The spring system should be arranged to work in the required direction. In this respect cantilever springs and the proposed "rocker" springs furnish a partial solution; at least an improvement. In combination with air tires it is probably sufficient for all present practical purposes in connection with pleasure cars. And for heavy vehicles with relatively unelastic tires the "composite wheel," affording a yielding movement in its own plane, yet not affecting the axle, is strongly suggested—so much more as it obviates most of the operative troubles connected with traction on difficult road surfaces, with starting of heavy loads and with clutches and differentials—while the development of a non-vibrating fibrous material for the central disks of such wheels, as well as for other truck wheels, represents one of the attractive additional possibilities; on which enterprising manufacturers are already working, seconded by a host of inventive experimenters with plastic materials. A more remote practical chance of the same general nature lies in the devising of a tire material giving a minimum of flexion under static load, yet more yielding to shocks and less bounding than solid rubber (so as to confine shocks to the running-gear if the spring suspension is right); having in fact just enough resiliency to recover its shape slowly after a flexion.

The two materials last mentioned are frankly the prod-

ucts only of industrial dreamland, as yet, so far as their use in the automobile industry is concerned, but the rest of the required improvements are plainly within reach, and their conception is based, not primarily on abstruse theorizing or figuring, but simply on the self-evident desirability of removing those three main shortcomings in present-day springing which all can observe. The theoretical considerations which have been brought out in the preceding articles have served mostly to bring under the reader's mental debate the whole complexity of factors which should influence reasoning and construction.

Sponge Rubber with Nitrogen Under Tension for Filling Tires

SHORTAGE of rubber has interrupted German experiments to determine the durability of a new substitute for air in tires. The substance is called *Schaum-Kautschuk*, which would correspond to foam rubber or sponge rubber, and is produced by placing raw rubber in a steel container and heating it. At an intermediate temperature, when the rubber is soft and sticky, nitrogen gas is pressed into the form under a tension of 400 atmospheres, under which pressure a large percentage of it is dissolved in the rubber. The heating goes on until the rubber with the nitrogen is vulcanized—and the vulcanization is the feature that promises durability for the finished product—whereafter the pressure is partially released and the nitrogen returns to its free state as a gas which is capsule in millions of minute blisters in the rubber, the pressure remaining 8 to 10 atmospheres. In this form the substance is pressed directly into tire casings. Its heat conductivity is very small and the specific gravity varies from 0.1 to 0.4 (the large variation indicating a remaining imperfection in the process), and the original amount of rubber is swelled to five times its volume.—From *Automobil-Rundschau*, April, 1915.

A New Overland Four—Price Lower

(Continued from page 981)

Brakes are operated in drums of 2 1-4-inch face width, and the expanding emergency set acts upon the inner side of the drum with a diameter of 13 inches, with the service contracting set having a working diameter of 13 3-8 inches.

Rear springs are three-quarter elliptic and hung under the axle. They are 47 inches long with a width of 1 3-4 inches.

A demonstration run in the new Overland revealed to THE AUTOMOBILE representative that the car is a highly-developed example of low-priced machines. The roomy roadster model was used, the seats being low and of the proper angle to fit

the back. In driving the car, the convenience of the accelerator pedal is specially noticeable in that it extends forward between the clutch and brake pedals, and does not require any stretching to reach it. Several tests of the ability of the starter to take care of itself under extreme conditions were made, and it was very evident that no harm could come to it through attempting to throw its gear into mesh when the engine was running. The cloth upholstery is very comfortable especially when going at a good speed and does prevent slipping. The motor handles the car in excellent shape and has ample pulling power in rough going.

Larger Motor in 1916 Hupmobile

(Continued from page 985)

shock. Little things which make for completeness are the provision of leather backing to the front seats—thus lining the whole tonneau with leather—and the supply of a soft tonneau carpet. On the six-passenger touring car, and in the limousine, there are folding seats of a rather larger size than is customary on cars of medium price. The top is a mohair one-person type and has Collins curtains that are easy to put up from inside.

New Pattern of Windshield

The new style of windshield in which the upper glass overlaps the lower is a feature of the Hupmobile equipment and

makes for great comfort in wet weather, since it gives a well-protected driving view when slightly raised. Also in hot weather, it can be raised just a little to admit a strong ventilating draft without withdrawing the protection to the eyes.

The standard color of the 1916 Hupmobiles is a fairly dark shade of blue which goes very well with the black running gear and mudguards, and with the cinnabar red wheels. Prices for the coming season are: Five-passenger touring car, \$1,085; seven-passenger touring car, \$1,225; all-year touring car, \$1,185; roadster, \$1,085; limousine, \$2,365; sedan; \$1,365; and coupé, \$1,165.

ACCESSORIES

New J. M. Shock Absorber

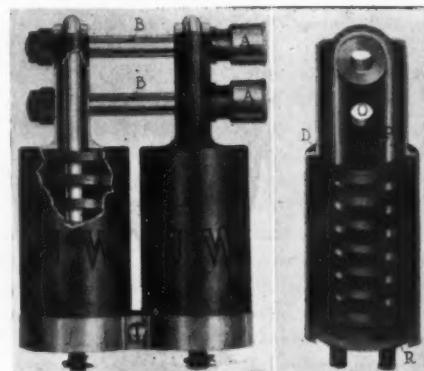
A new improved type of shock absorber has been brought out by the J. M. company under the model number of Z-2. It is of unique construction in that all the wear is taken upon a single bushing of Non-Gran bronze and since this can be replaced at a very slight cost should it wear out the shock absorber is given an unlimited life with an upkeep expense of practically nothing. Since the shock absorber is guaranteed for 2 years against wear or defect, even these bushings will be replaced by the manufacturer.

The shock absorber is a plunger and spring design as shown in the accompanying illustration. The plunger is formed by a hairpin-shaped bolt with a spring retainer on the end, the spring surrounding the plunger and bearing against a shoulder on the housing at the upper end. Thus the spring operates between the movable housing and the stationary plunger spring retainer. The exact operation will be made clear from the accompanying illustrations. Referring to the transverse section the spring is held between the shoulder D and the spring retainer R surrounding the hairpin-shaped plunger P. The bolt from the spring passes through the hole O through the housing and through the Non-Gran bronze bushing B. Thus it will be seen that all the wear is taken up on this bronze bushing.

Ample provision is made for lubricating the shock absorbers by the grease cups A and the oil holes B. The price of the shock absorbers is \$30 per set.—The J. M. Shock Absorber Co., Inc., Philadelphia, Pa.

Wright Piston Rings

With the idea of getting away from the possibility of leakage through the



Exterior and part sectional view of the new J. M. shock absorber. All the wear is taken on a single bushing of Non-Gran bronze



Wright piston ring which consists of two eccentric rings, one being superimposed upon the other in such a way that the two slots are kept 90 degrees apart

slot or break in the one-piece type of eccentric piston ring, the Wright ring, as designed, consists of two eccentric rings, one being superimposed upon the other. The ring is so made that when placed in its groove in the piston, the two slots, which are cut in opposite directions, are permanently separated by about 90 degrees. The eccentric shape of the ring is planned to insure even pressure all the way around its fitting face. Close-grained gray iron accurately sized and surfaced to fit is the material used. The use of these rings is claimed to increase motor efficiency, reduce gasoline and oil consumption and to decrease carbon deposits and the necessity for valve grinding. The rings are manufactured by W. W. Wainwright & Son, Connersville, Ind. The standard width of the rings is 1-4 inch and the standard thickness 3-16 inch. Prices vary from 65 cents each for rings under 3 inches diameter to \$1.25 each for those under 5 1-2 inches diameter.—The V. A. Longaker Co., sole distributor, Indianapolis, Ind.

Shield for Wet Weather

The Smith Road-View shield visor is an appliance made to keep rain, snow or sleet off windshields. It consists of a metallic frame holding within it a plate glass. This frame is attached to the front bow of any automobile top by two friction



Smith Road-View shield visor designed to keep rain, snow and sleet off the windshield. It fastens to the front bow of the top

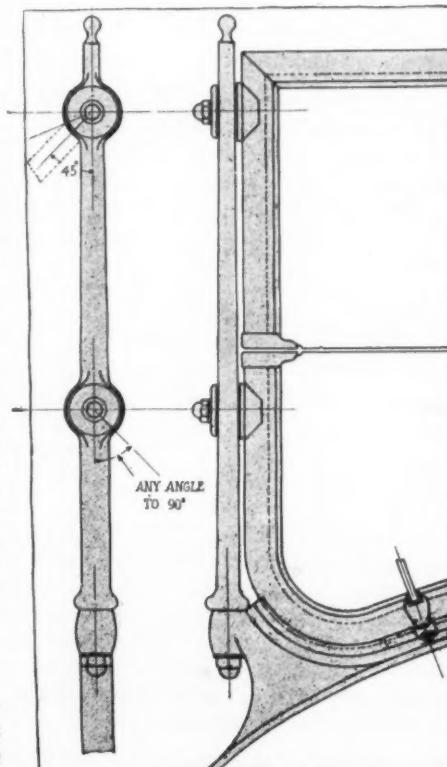
joints, making positive automatic action. In putting the top down, the visor folds up against the inside of top and thus both visor and top fold back together.

The Road-View shield visor stock sizes are 8 1-2 by 39 inches and 8 1-2 by 41 inches, the former costing \$5 and the larger one \$5.50. Other sizes will however be made to order.—Joseph N. Smith Co., Detroit, Mich.

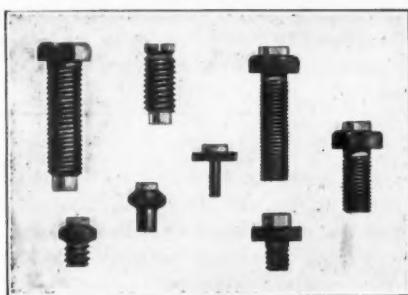
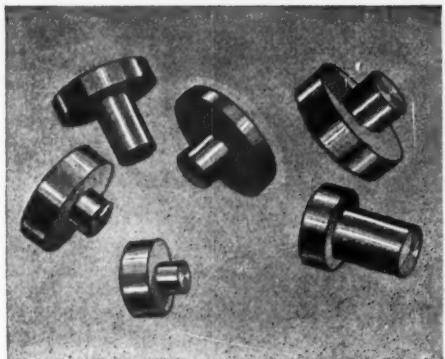
Vanguard Windshields

The Vanguard Mfg. Co., which devotes its plant solely to the production of windshields, makes its specialty in a variety of sizes and styles to meet the demands of nearly any car. All of them are constructed of steel with black enamel finish. In many styles either coach glass or plate glass is obtainable, the former being considerably cheaper. It is thinner, and not so durable.

Straight shields and zig-zag types for older cars are supplied but the newest type is the rain-vision, ventilating construction, the form of which is shown in the sketch. This has straight side supports to which the two panes of glass are pivoted to swing inward or outward as desired. The side supports are fitted with attachments at the top for holding the one-man form of top. This particular form shown is used on Paige-Detroit cars and the side members are forgings. The pivots are arranged to hold the glass at any angle up to 90 degrees, or horizontally. There is no metal strip where the edges of the two pieces of glass come together, but small



Detail of Vanguard rain-vision ventilating windshield. The pivots will hold the glass at any angle up to 90 degrees, or horizontally



Upper—R. & H. platinum rivets. Lower—Screws made of the same material

metal clamps screwing into the side portions of the frame of the glass serve to hold it firmly in position in the frame, which may really be called a three-quarter frame. Various methods of attachment to the cowl are possible, that shown being by bringing the end of the side support through a receiving hole in the body support and threading the side member for a nut.

The latest product of the Vanguard factory is the Ford De Luxe windshield and cowl. A form of two panel straight shield with straight side supports similar to that described above is fitted to a steel cowl, the whole thing being made to attach to the top edge of the Ford body. It attaches to the dash and body of the car at identically the same points and using the same bolts as are required with the regular windshield coming as standard equipment with a Ford. This makes its mounting very easy. These cowls are made in two sizes to fit either the 1912-13 Fords or the 1914 and 1915 cars. In either size the assembly is sold for \$20.

Other shields range in price from \$12.50 to \$25 depending upon the style and kind of glass.—Vanguard Mfg. Co., Detroit, Mich.

R. & H. Platinum

With the disturbances abroad, inquiry is often made as to what will be the effect on our supply of platinum. This metal which is so vital in securing the best results for use at the contact points of spark coils, magnetos and other electrical apparatus is so necessary that the maintenance of a steady supply is of prime importance. With this in view, the R. & H. Platinum Works, one of the largest concerns devoted to the manufacture of

platinum tip screws and rivets, has increased its plant and the facilities for the manufacture of these products. The plant is located at Perth Amboy, N. J., and here the product refined from South American ore is manufactured.

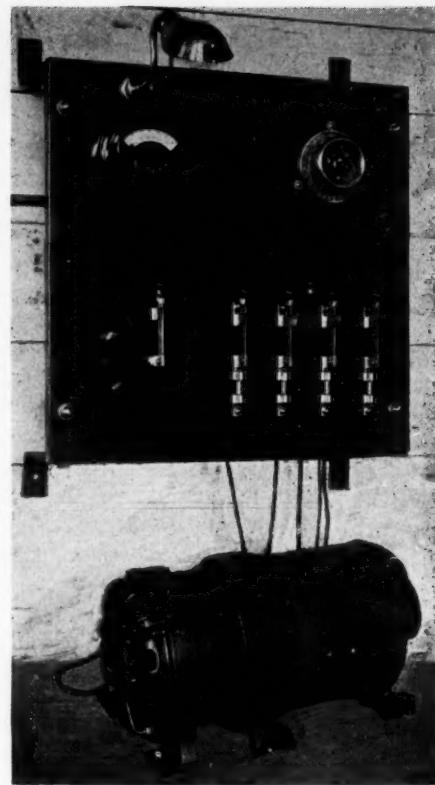
The art of manufacturing the platinum and iridio-platinum tipped screws and rivets has advanced so rapidly that where thousands of dollars were previously wasted by the necessity of having a platinum shank on the platinum tip in order to make a connection to the screw or rivet, now by electric welding a connection can be made which allows every particle of the platinum to play its part as a contact point and not as a fastening device. These iridio-platinum compositions are made to any specifications and can be furnished to any degree of hardness. Where the shanked tip is desired, instead of using the platinum for this purpose, nickel can be employed for the shank while the tip itself is of any desired composition of iridium and platinum. The accompanying illustrations show the iridio-platinum rivets with nickel shanks and iridio-platinum tipped screws and rivets in which the alloy is welded.

Self-Lubricating Springs

A design of automobile spring which is styled a self-lubricating type has as a feature the cup-like depression D stamped in either end of every leaf of the spring. These cups are filled with a heavy, non-fluid lubricant having the property of long life. The lubricant is spread over the entire friction area by the action of the spring in service, it is said. A natural slight concavity of the spring leaves themselves provides an easy channel for the lubrication of all parts. The maker gives a two-year guarantee against defective material or workmanship from the date of making.—Detroit Steel Products Co., Detroit, Mich.

Lincoln Battery Charger

The accompanying illustration shows a motor generator set for charging ignition and lighting batteries. The outfit comes complete with switchboard as shown. The set consists of a single-phase motor with a shunt-wound generator, the motor starting up from the direct current end, current being taken from the battery which is to be charged, the generator acting as a shunt motor. This method of



Lincoln battery charging outfit which comes in two sizes. It consists of a motor generator and switchboard

starting is accomplished by having two middle clips of four-pole switch higher than the remainder. These are connected to the battery and engage first as the switch is closed, throwing the battery current across the armature. When the set comes up to speed the switch is thrown entirely in and the set starts to charge the battery on the alternating current. Batteries are charged in series, the current being varied by raising or lowering the field voltage. This is an excellent arrangement for garage use where the number of batteries charged varies from day to day.

The switchboard is arranged for wall mounting. It is about 2 feet square and carries a starting switch, volt-ammeter, pilot lamp and a switching device for throwing the cells in series for charging.

The outfit is made in two sizes, the smaller for charging one to eight cells, the larger having a capacity up to fifteen. The motor generator set uses two ball-bearings.—Lincoln Electric Co., Cleveland, O.



Self-lubricating spring made by the Detroit Steel Products Co. The cup-like depressions D are filled with heavy lubricant which lasts a long time. This is spread over the leaf surface by the action of the spring



Assembled view
of the Walter pos-
itive drive differen-
tial

A NEW type of worm differential which is of exceedingly simple design, and which has the meritorious feature of driving both wheels, regardless of the traction condition of either has been put on the market under the name of the Walter positive drive differential. The differential consists of two pairs of spiral gears mounted in a two-part housing as shown in the accompanying illustration. The two pairs of spiral gears mesh together and also mesh with worms mounted in the housing and on the drive-shaft. The housing is in halves which are alike except for the flange for the bevel gear. The two bolts which hold the housing together set one ahead of the other in order to bring the spiral gear pairs into direct mesh.

22.5-Degree Lead Angle

The worm can be given any desired pitch within the limits of good practice, but in the standard design they will have a 22.5 degree lead angle as this has been found to be the best in practice. The construction is not limited, however, to any special spiral angle.

With this construction, the operation will be as follows: The driving resistances of the wheel tend to rotate the spiral gears on their pins in opposite directions. When one wheel has a greater resistance the inequality of force cannot drive the other wheel faster as the spiral gear cannot drive the worm on account of the relationship of the pitch angle to one another. The result is that both wheels are positively driven. When turning, the outside wheel rolls faster and so permits the inside wheel to turn correspondingly slower, giving a compensating differential action.

Worm gearing has been chosen because it provides strength, while at the same time giving a smooth and pliant action. The flexibility of the worm gearing is very effective in diminishing the shocks transmitted through the differential mechanism.

Five Advantages

Five advantages are claimed for this type of differential. These may be briefly summarized as follows: 1—The car will not stall if a single wheel alone has traction. 2—The motor power is used more effectively as both wheels are steadily driven. 3—Skidding is eliminated in

Walter Differential Uses Irreversible Worm

Equal Drive to Both Wheels— 22.5-Degree Lead Angle Employed

many cases due to the steady driving of both wheels. 4—More even pulling is secured on a rough road for the same reason. 5—The wear and strain on tires due to an accelerated or spinning wheel recovering the road is eliminated, a notable advantage for economy.

Different from 45-Degree and Ratchet Types

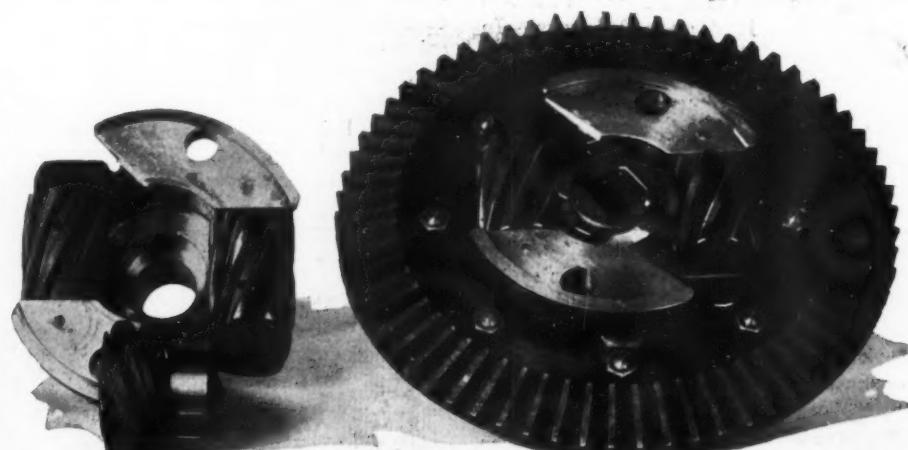
As will be noted from the foregoing description, this differential is different in construction and principle from the 45-degree type and the ratchet differentials which have an over-running action. The widest difference between the 45-degree and this is that it is a positive drive in the first place, and secondly, it is irreversible whereas it is the nature of 45-degree gears to be perfectly reversible. The distinction between the Walter differential and the ratchet differential is two-fold as far as operation is concerned. In the first place, it has not an over-running action, and, secondly, instead of driving the wheel of most resistance, the two wheels are given equal power.

Tire Fabric Must Stand Test

Following is an account of a fabric test in the factory of the Goodyear Tire & Rubber Co., Akron, O., which turned out 1,500,000 automobile tires last year:

First, the threads per inch are counted, the width is measured, the column bow measured (which shows how near the warp and filling threads are at right angles to each other), the selvage noted to see if it is slack enough, broken threads, weak threads, holes and oil spots are watched for, and the uniformity of weaving is criticized. Then the total length and weight of the fabric is checked up with the invoice, and the ounces per square yard are figured from the company's own measurements. Before the rolls are passed on into the factory, the strength, gauge, twist, crimp and per cent. of moisture are ascertained.

Pieces of fabric are returned to us from the bias cutters and are tested all over again to see how they have been affected in the calenders. The resulting records form a library upon which our specifications are based.



View of crown gear, differential assembly and arrangement of Walter positive drive device



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Modernize the High-Priced Car

AT the 1915 shows it was obvious that while the design on moderate-priced cars was changing rapidly, the expensive machines remained very much the same as they had been for several years past. It seems likely that the coming of the eight and twelve is going to bring about great changes in the factories which have so far specialized on cars costing from \$3,500 upwards. The effect of this may be much greater than might at first be imagined, because the high-priced car has, during the last several years, taken a less and less important place. No longer do we look to the erstwhile leaders of design for innovations, and the firms that began by imitating are now in the front from the design viewpoint.

Perhaps the high-priced car needs a little modernizing if it is to continue to be worth its price and even if there is no commercial compulsion the high-class manufacturers with their experienced staffs and smaller outputs are in an ideal position for the production of very up-to-date chassis. To date the expensive car has been a more imposing vehicle than the cheaper types, but often the performance has not always established its superiority of design. If it is modernized to the point where it once again takes the lead as a performer on the road it seems likely that many a man will feel it worth while to put out an extra \$1,000 or more who would otherwise have refrained from doing so.

If this comes to pass, as looks extremely probable, it will be a great thing for the American automobile industry, for it will encourage foreign business in markets so far hardly touched and thus will hasten the ultimate complete supremacy of the American automobile.

300-Cubic-Inch Results

THE 300-cubic-inch motor has made good in the 500-mile race by raising the speed average from 82.47 to 89.84 miles per hour, a performance which the most optimistic did not anticipate and which was partly due to the brick track being cool after nearly a week of continuous rains, and further due to the lack of sunshine which cut all of the glare that is present when the sun is shining out of the drivers' eyes, thus giving ideal conditions, and such as may not be present again for several years. They were conditions not present at any previous 500-mile race.

Perhaps the most amazing feature of the race was the regularity of the pace set by the different leaders, a pace which at no time was less than 89 miles per hour and never higher than 91 miles. Although leaders shifted very frequently until the 350 mark was reached still the average per hour hung in the same place. In other words, the 300-inch motor as developed by at least three different makers is capable of an amazing speed, and all three makers are deserving of credit for getting such wonderful results. Stutz, as the American representative, deserves all credit to build three new cars and have all finish in the money which is a performance rarely, if ever, equaled in this country or abroad. New motors are always expected to fail in the first big race, but this race has proven otherwise in the Stutz case, only one of the three suffering mechanical troubles, but not of such moment as to put it beyond the money class.

Lubrication a Factor

A few problems yet confront many of the makers of the high-speed 300-inch motor. First in this category comes the question of lubrication, nearly one-third of the cars eliminated going out with lubrication troubles in which a piston seized, or a connecting-rod broke due to a bearing burning out. This problem of the high-speed motor will soon be solved. The small high-speed motor is now in this country and a season or so will elapse before it is finally mastered. In fact, all of the lubrication troubles of the race were not on the American cars, some of the foreigners failing in this respect.

Triumph for Cord Tires

The race has been a signal advance for cord tires, as every one of the ten to finish in the money used Silvertown cords, and the eleventh car which covered the 500 miles but just outside of the money was also fitted with them. These tires gave a better account of themselves than a year ago, particularly in that there were few, if any, cases of treads flying off, and in the whole race there were only two cars that came to the pits without tires on, or had entirely thrown them off.

Buick Will Make Sixes Only

Two Chassis Comprise 1916 Line—44,553 Cars Built for 1915 Season

DETROIT, MICH., June 2—*Special Telegram*—Sixes only will be made by the Buick Motor Co., Flint, Mich., for 1916. It is a radical departure from the policy of this company, which has been building fours ever since it started in business 14 years ago. Two chassis will be made, one having a wheelbase of 115 inches, the other with a wheelbase of 130 inches. On the smaller cars the motor will be 3 1-2 inches by 5, while on the larger cars it will be 3 3-4 by 5. Motors will all be block cast and with the valves in the head.

There will be two entirely new body models, a sedan and a coupé. Bodies will be greatly improved in design and finish. All cars will have cantilever rear springs and semi-elliptic front springs and the windshield will be of a new design. Genuine black leather will be used for upholstery.

The four small cars consist of model 44 roadster, listing at \$950; model 45 five-passenger touring car, \$985; model 46 three-passenger coupé, \$1,350; and model 47 sedan; a closed car for city purposes, \$1,875.

The two big sixes are model 54 roadster at \$1,450 and model 50 five- or seven-passenger touring at \$1,485, which is \$165 less than the 1915 model. Wooden wheels, with demountable rims and 32 by 4-inch tires on the small cars and 36 by 4 1-2 on the big cars, will be used.

During the 1915 season just ended the Buick company built and sold 44,553 cars. For next year an output of at least 60,000 is scheduled.

New Six-Cylinder Boat-Body Mitchell for 1916

CHICAGO, ILL., June 2—*Special Telegram*—The Mitchell-Lewis Motor Co., Racine, Wis., is out with a new six-cylinder model for 1916 selling at \$1,250 as a roadster or five-passenger and at \$1,285 as a seven-passenger. This model shows advancement over the 1915 designs, body design and in chassis units as well. It has a block motor as against pair-cast for 1915, dimensions being 3 1-2 by 5 inches. Wheelbase is 125 inches and rear suspension is by cantilevers. Tires are 34 by 4 with non-skids in rear.

The new body is fashioned after boat designs having an uninterrupted line from the windshield base to the radiator filler neck. There is a tumble-in effect and a large bell-shaped back.

In its new block motor the company has produced a decidedly neat and accessible unit. A removable cylinder head is employed. The carburetor, fed from a Stewart vacuum tank is mounted high on the right side, bolts to the casting and feeds through cored passages. A hot-air pipe is attached vertically to the exhaust pipe on the opposite side. Ignition is by a battery type system with the distributor mounted on the left and driven from the timing gear housing. Starting and lighting is by the single-unit system, the drive from the motor being through a cone clutch and hollow propeller shaft to a floating axle.

Reo To Increase Production—No Changes in Cars

LANSING, MICH., June 1—While it has been rumored that the Reo Motor Car Co. is soon to announce its new models for 1916, officials of the company make the statement that the company has not had any intention of bringing out a new model for next year. In fact, the plans are said to be to continue the 1915 models, but to increase the 1916 production from 50 to 75 per cent. The demand for the 1915 cars has been such that the scheduled output for the season will show to have been over 2,000 cars under the orders received.

Fiat Brings Out Riviera Model as Four and Six

POUGHKEEPSIE, N. Y., May 29—A new model, known as the Riviera, has been brought out by the Fiat Co. and mounted on its four- and six-cylinder type 55 and 56 chassis. One of the special features of the new type of body is its simplified lines which have resulted in a weight reduction which is stated by the makers to be 600 pounds below other bodies of a similar type. It is a combination five- and seven-passenger design and sells, completely equipped, for \$4,850 on the four- and \$5,350 on the six-cylinder chassis.

The cylinder dimensions for the Riviera model on the four-cylinder chassis are 5.125 by 6.75 inches. The motor is featured by having the intake and exhaust manifolds cast integrally with the cylinder, a hollow chrome nickel steel crankshaft and many features of design which follow European practice. The entire chassis is designed and built in the Fiat shops. The wheelbase on this chassis is 128 inches.

The type 56, six cylinder car has a wheelbase of 135 inches and a bore and stroke of 4.4 by 5.9 inches. Otherwise all the specifications are the same as the Riviera four-cylinder model force feed oiling, Fiat double-jet carburetor, irreversible worm and gear steering, multiple steel disk clutch, etc.

Speedway Assn. of America Planned

To Correlate Various Activities of Different Speedway Movements—Prizes \$264,000

INDIANAPOLIS, IND., May 29—Preliminary steps in the organization of the Speedway Assn. of America were taken here today by representatives of the seven speedways that will hold meets this year. This new association has in mind the correlation of the various activities of the different speedway movements in order to avoid conflict of dates for races, and to better the general welfare of speedway racing and perhaps promote the building of special racing cars for this speedway circuit. C. W. Sedwick of the Indianapolis speedway was today elected temporary president and F. E. Edwards of the Chicago speedway temporary secretary. A meeting for final organization and the election of officers will be held in Chicago June 17, two days prior to the opening of the new 2-mile board speedway in that city.

At today's meeting many plans as to the scope of the speedway association were discussed, and it is possible to see the time when such a central speedway organization may have its own corps of officials to handle the different meets, thereby greatly simplifying the task of staging the various meets. At present it is necessary to perfect an organization at each speedway for a single meet a year, and by organization this work could be vastly simplified. The same applies to the securing of entries, foreign ones in particular.

The seven speedways represented today were: Indianapolis, Chicago, New York, Sioux City, Omaha, Tacoma and Minneapolis. These seven have all scheduled one meet for this season and a total of \$264,000 is offered as cash prizes for these meets, as follows:

Sheepshead Bay Speedway Corp., New York	\$50,000
Indianapolis Motor Speedway, Indianapolis	50,000
Speedway Park Assn., Chicago	54,000
Twin City Motor Speedway, Minneapolis	50,000
Sioux City (Iowa) Speedway Assn., Sioux City	15,000
Auto Speedway Co., Omaha, Neb.	15,000
Tacoma Speedway Assn., Tacoma, Wash.	30,000
Total	\$264,000

These seven speedways have a total track mileage of 13.75 as follows:

Speedway	Surface	Miles
Sheepshead Bay	board	2
Indianapolis	brick	2.5
Chicago	board	2
Minneapolis	cement	2
Sioux City	dirt	2
Omaha	board	1.25
Tacoma	board	2
Total		13.75

With one meet on each of these seven

speedways for this season there will be a total of 3,150 miles of racing. Sheepshead Bay, Indianapolis, Chicago and Minneapolis are scheduling 500-mile events. Sioux City and Omaha are each 300-mile events and Tacoma has three races on 2 days giving a total mileage of 550. There is a probability that Chicago will have a second meet this fall.

Goan Heads Varnish Co.

DETROIT, MICH., May 26—O. S. Goan, of New York, was today elected president of Berry Bros., one of the biggest varnish manufacturing concerns in the United States. Mr. Goan succeeds Frank W. Blair, of the Union Trust Co., Detroit, who will devote all of his time to the latter concern.

Maxwell Report May Show Earnings of \$3,000,000

NEW YORK CITY, May 31—The fiscal year of the Maxwell Motor Co., Detroit, Mich., will end July 31, and indications are that net profits will run close to \$3,000,000 after liberal charges for depreciation, compared with \$1,505,467 in the preceding year. In other words, the company will earn its first preferred dividend about four times over.

The preferred stock of Maxwell Motors is selling around 84, carrying dividends of 1½ per cent. and an extra payment of ¼ and 1 per cent. on account of back dividends. The books will close on June 10 and the dividend will be payable July 1. After the payment of the 2½ per cent. there will still be an accumulation of \$15 a share on the first preferred.

Wellington Mutual Production Manager

JACKSON, MICH., May 31—J. W. Wellington, formerly treasurer of the United States Motors Co. has been appointed production manager of the Mutual Motors Co. of this city. Fred Buchler has been made factory superintendent, having formerly occupied this post with the Imperial company of this city.

Springer Back from Europe

YOUNGSTOWN, O., May 31—Frank V. Springer, who has been in Europe representing the Republic Rubber Co. for several months, has returned and will be connected with the home office of the company. Mr. Springer when abroad was investigating general rubber conditions in the British Isles and on the continent.

To Classify Studebaker Directors?

NEW YORK CITY, June 2—On July 7 stockholders of the Studebaker Corp. will meet to vote on a proposal to classify the company's directors into five groups, one of which will be elected annually.

Erskine To Head Studebaker

J. M. Studebaker Retires—Fish Succeeds Him as Chairman of Board of Directors

SOUTH BEND, IND., May 29—J. M. Studebaker, Sr., last of the Studebaker brothers, who founded the corporation which now bears their name, is about to retire as chairman of the board of directors and will become the honorary president of the concern. This is the announcement by Frederick S. Fish, president of the corporation, who succeeds to the office of chairman of the board of directors. A. R. Erskine, first vice-president, will be made president and the post which he now holds will be abolished. In speaking further in regard to the matter Mr. Fish said: "The present organization of this corporation is the best it has ever had in its history, which is proved by the successes which have attended its administration. The object of the changes is to perpetuate for the longest time possible a continuation of this happy condition. This necessitates a change in the charter which it is expected will be effected on July 7 at a specially called stockholders' meeting for that purpose. About 3 weeks ago the matter was brought before the board of directors and after a full discussion, they concurred in the plan, all of which, in every detail and essential, is of my own initiation and suggestion, with the exception that I made a confidant of J. M. Studebaker." Mr. Studebaker was for many years president of the Studebaker Bros. Mfg. Co., succeeding to that position upon the death of his older brother, Clem Studebaker. He remained president until the reorganization of the concern as the Studebaker Corp., when he was named chairman of the board of directors.

Paul Smith Is Chalmers Sales Manager

DETROIT, MICH., May 29—Paul Smith, well known in trade circles, becomes sales manager of the Chalmers Motor Co. June 1. Percy Owen, who has held this position for some years, advances to the newly-created office of general sales manager. In his new capacity Mr. Owen will pay special attention to foreign sales, while Mr. Smith is to have direct charge of salesmen under Mr. Owen.

In conjunction with this change another important step has been taken by the Chalmers company. Hereafter the service department will be discontinued as a separate unit but will become part of the sales department and will be un-

der the direct supervision of Mr. Owen.

Undoubtedly Mr. Smith is one of the best known and best liked men in the entire automobile industry. His broad experience in the field, together with his large acquaintance with dealers throughout the world, will complete a sales organization that has made new automobile history during the past few months. Mr. Smith won his spurs through his early connection with the Studebaker Corp., during which time he succeeded in establishing selling connections in practically every city in the world. Later he became manager of the Lozier Motor Co. and more recently resigned to accept the presidency of the R. S. Corp., with headquarters on the Pacific Coast.

Macauley on Packard Board of Directors

DETROIT, MICH., June 1—Alvan Macauley, vice-president and general manager of the Packard Motor Car Co., has been elected to the board of directors. Mr. Macauley succeeds J. W. Packard of Warren, O., inventor of the first car of that name. While Mr. Packard retains his financial interest in the company, he retires from the directorate to devote more time to other pursuits.

It is said that in the production of the Twin Six, recently announced, the resources of the Packard company are to be utilized on a scale never before approached by that concern. Cash on hand in the treasury is said to total over \$6,000,000, so there will be no lack of finances for carrying out plans for a largely increased production under the most advanced methods.

Stalnaker Pathfinder Vice-Pres.

INDIANAPOLIS, IND., June 1—*Special Telegram*—W. E. Stalnaker, who for 6 years has represented the Premier in Chicago, and who since the first of the year has retained the Pathfinder line, was today elected vice-president of the Pathfinder Co., this city, and will have charge of the sales. His Chicago business will still be continued and represents the Pathfinder.

Insurance Fund for Race Drivers

NEW YORK CITY, May 31—Ray Harroun, Maxwell chief engineer, has made the suggestion that some definite plan should be put into effect that will provide for the care of race drivers and riding mechanics, injured in the regularly sanctioned events of the season. He suggests that a direct path to such an end would be the establishment of a national insurance fund comprised of 1 per cent. of the gross receipts of the various meetings, this fund to be administered by a commission, representing the drivers, etc., as well as the entrants in the various meetings.

S. A. E. Summer Papers and Their Authors Announced—Cover Wide Field

Standards Committee Program Calls for Reports from 11 Divisions—Physical Properties of S. A. E. Steels One of the High Spots—Opportunities for Social Enjoyment

NEW YORK CITY, June 1—Announcements have been made covering the entire program for the summer meeting of the Society of Automobile Engineers. As THE AUTOMOBILE reported last week, the professional sessions are very complete, covering a wide field of subjects and giving a varied nature to the program which makes it one which will appeal to a large percentage of the Society membership. Reservations for the summer meeting are coming in at a rapid rate and the session, which will last from June 14 to 17, promises to be a busy one and at the same time, one which will afford time for the social enjoyment of the members and their families.

The itinerary of the trip, which was published in THE AUTOMOBILE last week, includes a steamship tour starting from Detroit on Monday, June 14 at 2 p. m. on the specially chartered steamship *Noronic*. The entire 4 days will be spent upon the vessel which during the trip will include such points as Midland, Parry Sound, Point au Baril, back to Parry Sound and then Detroit with a side trip on Tuesday afternoon on a smaller steamer through the Thirty Thousand Islands of Georgian Bay. Entertainments will be furnished by the sections on Monday, Tuesday and Wednesday evenings. The vessel is due at Detroit Thursday at 5 p. m.

Important Standards Work

Important work along the lines of standardization is expected at the meeting, as the reports of eleven divisions are counted upon. The divisions which will report include the ball and roller bearings, carburetor fittings, chain, electrical equipment, electric vehicle, international standards, iron and steel, miscellaneous, research, springs, truck standards.

The ball and roller bearings division will report a stock list of taper roller bearings and a stock list of thrust bearings.

The carburetor fitting division is working upon dimensions of flanges for 1-2 and 5-8 and for 2 1-2, 3 and 3 1-2-inch carburetors. It is also working upon standard dimensions for the outlet on the exhaust manifold for carburetor hot-air supply.

The chain division is examining the possibility of securing interchangeability of different makes of silent chains.

The electric equipment division is ex-

amining bulb bases, sockets and connector plugs and also methods of limiting headlight illumination.

Electric vehicle division topics include speed and mileage ratings, motor voltage, standardized motor name plates and number of cells in battery equipment.

International standards of solid tires are being considered by the newly created international division.

Probably of the greatest importance is the work of the iron and steel division, which expects to make announcements on the curves and tables of the physical properties of carbon steels which has engaged their attention during the past year. It is also considering the lower limit of vanadium in the chrome-vanadium steels, additional specifications on nickel-chromium steel and definite specifications of steel castings.

Many miscellaneous features are being discussed by the miscellaneous division including dimensions on small parts such as belts and pulleys, hose and hose clamps, speedometer driveshaft ends, thread tolerance, license pads, etc.

Tap drill sizes are occupying the attention of the research division, while the spring division is engaged upon a nomenclature of cantilever springs, the test of parallelism of eyes and master leaf of leaf springs, modification of eye and bolt tolerance for leaf springs and other dimensions covering the offset center bolts, nuts, width, concavity, etc.

The truck standards division is to make a report on industrial trucks and also on the advisability of a 34-inch truck wheel diameter. The full program of the professional session is given on this page. Copies of the paper to be presented at the meeting will be mailed to the members in separate pamphlet form early this month, and efforts are being made to have the members contribute written discussions on these papers when possible, having one copy from which to read and one to hand the stenographer at the time in order to insure the orderly arrangement of the material in the record. The meetings committee suggests that those who will contribute written discussions should forward their names before the meeting.

To Arrange for Visiting Members

During Monday morning, June 14, the society committees will have headquarters at the Hotel Statler in Detroit where all arrangements have been made for

taking care of the out-of-town members participating in the trip. The Detroit local committee is also making preparations to receive the members arriving Monday morning.

Reservations for the trip are being made through E. A. Holton, general passenger agent of the Northern Navigation Co., Sarnia, Ont. For the complete trip on the *Noronic* and *Waubic* the fare is \$26 per person, berths and meals included. Both in a professional way and from a social standpoint, the trip promises to be one of great profit. The professional program follows:

June 14-17
PROGRAM
Monday, June 14, 3 P. M.
Business Session
President's Address.
Treasurer's Report.
Report of Membership Committee.
Election of Nominating Committee Members.
New Business.

Professional Session
Automobile Clutches—W. F. Herst.
A Formula for the Comparison of Automobile Performance—C. T. Myers.
A Scientific Method of Testing Electric Vehicles—T. H. Schoepf.
Monday, 8 P. M.
Professional Session
Farm Tractors and Their Motors—Philip S. Rose.
Road Tractors—Frank H. Trego.
Increasing Truck Efficiency with Trailers—A. R. Miller.
Automobile Lubrication—C. W. Stratford.
Tuesday, June 15, 10 A. M.
Professional Session
Size and Inflation of Pneumatic Tires—P. W. Litchfield.
Spiral Bevel Gears for Automobile Drives—A. L. Stewart.
Pressed Steel Wheels for Pleasure Cars—Orrel A. Parker.
Spring Design—C. H. Gleason.
Tuesday, June 15, 8 P. M.
Standards Committee Meeting.
Wednesday, June 16, 8 P. M.
Professional Session
Aeroplane Engines—Neil MacCoul.
A Type of Truck for Military Use—Jerry W. DeCou.
Aluminum Alloy Pistons—Eugene Gruenewald.
Motor Fire Apparatus—Joseph A. Anglada.

Thursday, June 17, 10 A. M.
Reports of Divisions of the Standards Committee
Report of Carburetor Fittings Division—J. J. Aull, Chairman.
Report of Electrical Equipment Division—A. L. Riker, Chairman.
Report of Electric Vehicle Division—A. J. Slade, Chairman.
Report of Iron and Steel Division—K. W. Zimmerschied, Chairman.
Report of Miscellaneous Division—J. G. Utz, Chairman.
Report of Springs Division—C. W. McKinley, Chairman.

STATEMENTS OF PROGRESS
Ball and Roller Bearings Division—F. G. Hughes, Chairman.
Chain Division—F. L. Morse, Chairman.
International Standards Division—A. L. Clayton, Chairman.
Research Division—D. L. Gallup, Chairman.
Truck Standards Division—Wm. P. Kennedy, Chairman.

Deutsch Now Sales Engineer

DETROIT, MICH., June 2—*Special Telegram*—S. Deutsch, formerly chief engineer of the Detroit Electric Appliance Co. has opened offices in the Chamber of Commerce Bldg. as sales engineer. He is a direct factory selling agent for the Liggett Spring & Axle Co., Monongahela, Pa., manufacturer of springs and axles; F. Bissell & Co., Toledo, O., electrical devices; Blackburn Specialty Co., Cleveland, O., maker of the Yale lock ignition switches; the Stewart Mfg. Co., Chicago, Ill.; die moulded castings and steel reinforced die cast motor bearings.

Motors Needed for Chili Buses

Opportunity for American Manufacturers Who Act Promptly Through U. E. Bureau

NEW YORK CITY, June 1—Motor buses are practically unknown in Chili. Owing to the low buildings, the cities stretch over a great part of the land. The streets in the cities of Santiago and Valparaiso are very well paved.

A large company is about to start a bus service in Santiago. The buses will be built in Chili, but the motors will have to be ordered here or in Europe. Owing to the war in Europe, they will not be able to supply these, and here is a chance for the American machines.

Owing to the fact that only the motors will be bought in foreign countries, they will be imported free of custom house duties, as all machine parts do not pay duties. Fully equipped cars or buses now pay 5 per cent. of their declared value.

There has been considerable trouble with the trolley car service in Chili, especially in the big cities mentioned, on account of the companies having increased their passage money to double the previous amount.

In the cities mentioned, there are large distances to be covered, as runs of 5 to 7 miles are not unusual.

Another place where buses could be introduced for summer work is Viña del Mar, the summer resort of Chili. Lines running to the race course and beach could bring considerable business, as at present the means of transportation are an absolute failure in every sense.

As stated above, the street pavements are very good, all asphalt, and very well kept. In Viña del Mar, there are milk wagons transformed into motor buses, which do a large business.

Any inquiry about this will be gladly attended to by THE AUTOMOBILE through the United Export Bureau which was announced last week and which has a well-trained staff of South American employees and is therefore in a position to render every assistance in this line.

New Basis for Taxation in Ohio

CLEVELAND, O., May 28—A new basis for the listing of automobiles for taxation in Cuyahoga county has been announced by C. P. Salen and J. B. Ruhl, deputy tax commissioners of Cleveland. The new basis is:

Cars entirely new, return at 100 per cent. of list price; cars of 1915 model put in use prior to April 5, 1915, and since January 1, 1915, at 90 per cent. of list.

Cars of 1915 model put in use prior to January 1, 1915, and since February 1, 1914, at 80 per cent. of list price; cars of the model of 1914, at 50 per cent. of list price; cars of the model of 1913, at 40 per cent. of list price.

Cars of the model of 1912, at 30 per cent. of list price; cars of the model of 1911, at 20 per cent. of list price; cars of the model of 1910 and prior thereto at 10 per cent. of list price.

Lanier Joins Norwalk Tire

NEW YORK CITY, May 28—J. F. Lanier, in charge of the sale of Diamond tires in the Southwest, with headquarters at St. Louis, has severed his connection with the B. F. Goodrich Co., to join the Norwalk Tire & Rubber Co., Norwalk, Conn.

At various times Lanier has been in charge of the sale of Diamond tires in Kansas City, St. Louis, Buffalo, and New Jersey. In his new connection he will have entire charge of the sale of Norwalk tires for the central part of the country.

Schwalbach Joins Grossman

NEW YORK CITY, May 31—Alex Schwalbach, who recently resigned as advertising manager of the J. S. Bretz Co., and its successor, the Bearings Co. of America, will remain in Brooklyn, N. Y., to become advertising manager of the Emil Grossman Mfg. Co., manufacturer of accessories.

Elston Sells Pumpelly Interest

INDIANAPOLIS, IND., June 1—Sidney W. Elston, secretary and treasurer of Pumpelly Battery Co., this city, has sold his interest and severed connection with same. Mr. Elston will take a vacation of some months after which he expects to again engage in some branch of the industry with which he has been identified since the early years—the days of electrics and steamers.

Giants vs. Tigers on Overland Day

TOLEDO, O., May 30—Overland Day, June 21, when the New York Giants and the Detroit Tigers journey to this city to give 11,000 employees of the Willys-Overland Co. their annual baseball festival, will have considerable more than local interest for the sporting world. At his personal expense John N. Willys, president of the company, will bring the two teams together for the first time in baseball history.

Get London Agency for Scripps-Booth

LONDON, ENGLAND, May 27—Peters & Sons have taken the agency in this city for the Scripps-Booth export trade. They have contracted for 5,000 cars.

New 4-Cylinder Car at \$980

New York and Akron Interests Behind Co.—First of 5,000 Cars in Sept.

NEW YORK CITY, May 28—New York and Akron interests are behind a plan to manufacture a four-cylinder five-passenger touring car and roadster chassis to sell with complete equipment at \$980 to \$990. A feature of this car will be the careful attention to the blending of the lines of the body, cowl, hood, and radiator, while several novel ideas are included; among these are the novel form of radiator cap which will sweep upward like the lines at the bow of a boat, thus carrying out the straight lines which characterize the entire top of the V-shaped radiator, the hood and the body. A spare wire wheel is carried in the rear of the body while rear fenders are dispensed with, the wheels being carried under the body slightly at the side so that these are unnecessary. The touring car is a five-passenger with divided front seats and the roadster carries three in clover-leaf fashion.

Car Will Be Low

The whole car will have a very low appearance due to the front axle being dropped. The doors instead of being vertical are raked slightly to harmonize with the general design. The radiator will have a tall, narrow appearance when viewed from the front and no dash lights will be employed.

The block motor will be 3 3-4 by 5.5 giving an S. A. E. rating of 22.5 horsepower. The water is circulated positively by a pump and the customary fan is also used. The lubricating system is a circulating splash. Ignition is by magneto and electric lighting and starting are furnished. The crankshaft has three bearings. Drive is through a cone clutch and three-speed selective gearset, which are in a unit with the motor to an inclosed driveshaft and a helical bevel drive in connection with a semi-floating rear axle. Wire wheels are used on Q. D. demountable rims. The front fenders are crowned and follow the contour of the wheels. The springs are semi-elliptic in the front and overslung cantilever in the rear, taking the drive. Thirty-four by 4 tires are used and the equipment is complete.

It is expected that the first cars will be completed early in September. The company plans to do a large export business and its officials state that they have already received orders for 3,000 cars whereas the first lot to be manufactured will number but 5,000. No name for the car has as yet been decided upon.

Briscoe Adds Eight for 1916

Argo to Be Made Only as Four—New Plants for Both Concerns

JACKSON, MICH., May 28—A new plant for the Briscoe Motor Co., also one for the Argo Motor Co., will be started shortly. Concerning the 1916 plans of both concerns, it has not yet been finally decided as far as the Briscoe is concerned, except that an eight cylinder car will be marketed. The Argo is to be made only as a four, selling at \$435 for the touring car and \$385 for the runabout. From 10,000 to 20,000 are to be made, all told.

Two farms, the Murphy and the Horning, have been purchased to that effect by Benjamin Briscoe, president of the two companies. Upon the Murphy farm which covers 55 acres of ground there will be erected the Briscoe factory. The main building will be two stories high, 250 by 300 feet. There will also be an office building, testing buildings, a laboratory, a power plant. Near the factory will be a half-mile testing track.

It is claimed that the new plant will be so constructed as to enable an annual production of 50,000 Briscoe cars.

Details for the new Argo plant are not yet definitely settled. It will, however, be a much larger plant than the one now being occupied by that concern.

In addition to the manufacturing buildings, it is the intention of Mr. Briscoe to also erect a boys' trade school and a central clubhouse, for the use of all city people. The school is to make the teaching of automobile construction one of its features.

Improved Body in New Marmon Chassis Changes Small

INDIANAPOLIS, IND., May 30—The Nordyke & Marmon Co. has had a sample of its 1916 six on view at the factory during the past week. In specification the new car is almost precisely the same as the present type but the body is a little wider and more pains are taken to insure the high-class character of the finish. Several little alterations, such as a new way of fitting the back curtain of the top make for increased neatness and better appearance.

On the chassis the principal change is the introduction of an oil-pressure release valve in connection with the throttle, so that the motor gets more oil as the carburetor is opened. Bosch starting and lighting is retained but changed in that the pinion of the starting motor is mounted on splines on the armature

spindle instead of being keyed rigidly, this assisting an easy slip into mesh with the flywheel ring gear. In addition to the seven-passenger touring car there will be a few bodies of the three-seated, clover-leaf pattern. The company announces that, despite all rumors to the contrary, it has no intention of producing a twelve-cylinder car.

Two New Davis Sixes for 1916—Four Continued

RICHMOND, IND., May 29—The Davis Motor Car Co., this city, will bring out three models for 1916, a four-cylinder continued from 1915 with improvements and two new sixes, one listing at \$1,250 and the other at \$1,495. The four was called model 38 last season and now is listed at \$1,165 instead of \$1,235. The larger of the new sixes has a 125-inch wheelbase and comes in seven-passenger form only. Its motor is a Continental, 3 1-2 by 5, the clutch a cone and the gearset a three-speed. It is fitted with Westinghouse cranking, lighting and ignition. Tires are 34 by 4 1-2.

The small six has a 120-inch wheelbase and is fitted with a five-passenger body. The motor, also a Continental, is 3 1-4 by 4 1-2 and the other chassis units the same in design as those of the large six.

All Davis cars for 1916 have a new type of body with separated front seats, that for the driver being mounted on a sliding base and that for the front seat passenger being of the revolving type, so the occupant may turn around and face the tonneau passengers.

Haynes Announces Two Sixes for 1916

KOKOMO, IND., May 27—Preliminary announcements have been made regarding the new Haynes for 1916, which will consist of two sixes with three different body styles. The wheelbases are respectively 121 and 127 inches, and the cars are known as models 34 and 35. The same high speed design motor is used in the new models. Features are the self-lubricating spring, spiral bevel drive, adjustable front seats and disappearing auxiliary seats in the seven-passenger model.

A three-passenger roadster is mounted on the smaller car, or model 34, the center seat is dropped back in an aisleway left between the two forward seats, thus providing an unusual amount of carrying space. Other improvements are larger bodies, deeper upholstery, and the equipment includes a Waltham clock, a Boyce motometer, a trouble lamp, an automatic circuit breaker, to take the place of fuses, a Spartan horn and non-skid tires on the rear.

Madison Runabout on Display

Original Ideas in Body—Chassis Is Assembled of High Class Units

INDIANAPOLIS, IND., May 30—The first of the Madison cars to be made by the newly organized Madison Motors Co., Anderson, Ind., has been on exhibition here at the Severin hotel. This is a six with an attractive type of roadster body, known as Dolly Madison. The company is scheduling a production of 600 sixes with the roadster and touring body styles and will begin deliveries almost immediately. It is intended to introduce a small four-cylinder later in the year and this is to be turned out in much larger quantities. The company's slogan is that its car contains well-known components such as Rutenber motor, Detroit Gear & Mfg. Co. transmission and clutch, American Gear & Mfg. Co. axle, etc., and that these parts are assembled into a well-appearing whole.

The motor, a high-speed type 3 by 5 inches, uses a Stewart-Warner vacuum feed, and starting and lighting are cared for by a Remy two-unit system, which cares for the ignition, the distributor and contact breaker being magneto pattern. For the clutch a dry-disk design is employed with thirteen plates of alternate steel and asbestos fabric. The Hotchkiss drive is used, the rear springs being no less than 56 inches long and underhung. Actually, the springs are of three-quarter type with the quarter spring almost half the length of the main spring, this giving very easy riding. The steel used for the springs is said to be the best silicon-manganese. Wheelbase is 120 inches and the tire equipment consists of 34 by 4-inch Goodrich, non-skid in the rear.

Both the touring car and the roadster are to sell for \$1,375 but the latter has a set of five Houk wire wheels as standard equipment, while the touring car has wood wheels.

The Dolly Madison car is an extremely smart roadster and is exceptionally comfortable as it is supplied with a high door on either side. This makes a clean line with the hood besides protecting the passengers. There is a very large gasoline tank and the spare wheel is carried at the rear on a hub type of carrier to which it attaches precisely as on an axle.

The Madison company gave a luncheon to the press on Friday evening at which the new model was christened by Barney Oldfield.

Designs Four-Wheel-Drive Automobile
ST. LOUIS, Mo., May 28—What is said to be the first four-wheel-drive automo-

bile was launched here this week by the Neustadt Auto and Supply Co., its maker. The car was built for H. M. Boyd of Fort Myers, Fla., who after exhibiting the machine here a few days departed for Indianapolis and Detroit to urge the adoption of his design.

Boyd has taken out patents on the various features of his invention. A 1909 Apperson car was used as the basis of his present machine. Among the experiments demonstrated by Boyd here was that of placing the front wheels of his machine against a high curb and then forcing the car to climb the curb by the traction of the front wheels.

Paige Uncovers New Light Six at \$1,095

DETROIT, MICH., May 27—The Paige-Detroit Motor Car Co. is bringing out a light six-cylinder model, known as the Six-36, to sell at \$1,095 and to be the running mate of the model 46, the larger six-cylinder machine which was placed upon the market last January.

The new model is an exact reproduction of the larger six, so far as outward lines is concerned. It preserves the streamline type of body with the sloping cowl and hood and the pointed radiator, as first brought out by Paige in the Six-46.

The new model has a 3 by 5, block-cast engine, and conforms to approved conventional design for a light machine of this type. It is claimed that the car weighs 2,600 pounds.

Full details and photographs of the new Six-36 will appear in a later issue.

Chevrolet to Reduce Prices for 1916

NEW YORK CITY, June 1—The Chevrolet Motor Co., has announced for 1916 a continuation of the Baby Grand and Royal Mail touring and roadster cars. A material price reduction, however, has been made, the Baby Grand five-passenger car which formerly sold for \$985 being now \$750, the Royal Mail, formerly \$860, is now \$720 and the 4-90 selling at \$490 is continued at the same price, with electric lighting and starting, \$60 extra. This is a five-passenger touring car.

Continental Newest Truck

CHICAGO, ILL., May 29—The Continental Motor Truck Co., 343 South Dearborn street, Chicago, has placed four truck models upon the market. The Continental concern is a new one, made up of Chicago business men. The trucks will be manufactured in Detroit.

Former Federal Truck Head Dies

CHICAGO, ILL., June 1—E. R. Lightcap, formerly president of the Packard Motor Car Co. of Chicago, and the Federal Motor Truck Co., Detroit, Mich., died yesterday of pneumonia in Chicago.

Southern Automobile Sales Better

Farmers a Large Purchasing Power—Good Field for Trucks for Transporting Cotton

DETROIT, MICH., May 27—Lewis L. Halle, manager Abraham Brothers Motor Car Co., Paige and Chalmers dealers in Montgomery, Ala., was a Detroit visitor last week. Mr. Halle reports conditions in the South as considerably improved in the last 60 days, due to the price of cotton reaching 9 to 9 1-2 cents per pound, a figure at which the farmers could afford to start selling. Immediately cotton sales were made the purchase of automobiles started and has been increasing favorably since. Mr. Halle estimates that perhaps more than one-half of the cotton is still unsold. The result of this is that for this season not one-half the crop will be planted. To make up for this the farmers are raising spring wheat, corn and oats and going in more for cattle raising. This introduction of mixed farming should do much to avert similar conditions which took place during the past year. There is talk of starting a packing industry in Montgomery with the sole thought of interesting the farmers in the breeding of hogs.

At present many of the Montgomery dealers sell more than 60 per cent. of their cars outside of the city, these going to farmers who own from 500 to 1,000 acres. Montgomery, a city of 60,000, is situated in a county that has 600 miles of fine gravel road which makes it favorable for farmers using cars.

Up to the present time few trucks have been sold in Montgomery. There is a good possible truck field with the farming trade, trucks being used to transport the cotton to market.

One condition which has helped the sales of cars recently is that the French and English governments have purchased 5,000 horses and mules, these largely coming from the farmers. This has enabled the farmer to finance himself for a few months.

At this writing the Montgomery dealers have not formed a dealers' organization but they have been acting in concert in many movements to their own advantage.

Wadsworth to Manufacture Bodies

DETROIT, MICH., May 28—F. E. Wadsworth, who is secretary and treasurer of the Detroit Motor Car Supply Co., the Detroit Engine Works and the Michigan Steel Boat Co. has purchased a tract of land 300 by 1,200 feet, between Jefferson avenue and Kercheval, and will start the erection of an automobile body plant.

The latter will be four stories high, 240 by 260 feet.

It is expected that 500 to 800 men will be employed.

The name of the new company which is to be incorporated has not yet been decided. It is, however, stated that its officers will not be those of the concerns with which Mr. Wadsworth is now connected. In fact, this new business will be run entirely independent from the other companies.

It might be mentioned that very recently Mr. Wadsworth declined an order for several million dollars worth of war material intended for the British government.

Oakland Officials in Session

PONTIAC, MICH., May 27—Oakland Motor Co.'s branch managers, special representatives and officers and officials of the company met today at the first day of the annual 3-day convention.

The 1916 models, the sales policy, the sales campaign, the general situation in the land, and many other matters touching upon the industry in general and the Oakland business in particular will be discussed.

Those present today were: C. W. Nash, president of the General Motors Co., also vice-president and general manager of the Oakland Motor Co.; Fred W. Warner, general sales manager of the Oakland company; C. B. Voorheis, assistant sales manager; J. H. McDearmon, assistant sales manager; the following branch managers: W. B. Tracy, Detroit, Mich.; E. J. Kilbone, Chicago, Ill.; B. W. Losey, Minneapolis, Minn.; L. B. Saunders, Boston, Mass.; K. R. Roberts, San Francisco, Cal.; L. S. Shoup, Indianapolis, Ind.; J. T. Simons, San Antonio, Tex.; A. P. Ten Brook, Kansas City; J. E. Johnson, Philadelphia, Pa.; also the following special representatives: Fred. C. Wood, W. P. Upham, C. L. Zutavern, H. C. Maley, Chicago, director of advertising, and H. H. Thatcher, manager Michigan sales.

Benson Attends Studebaker Convention at Portland

PORLTAND, ORE., May 27—First Vice-President E. R. Benson, of the Studebaker Corp., Detroit, was the guest of honor at the convention of Studebaker dealers and distributors of this district. Mr. Benson spoke to the force of about 100 which comprised the gathering, expressed his satisfaction at what had been done this season, spoke about the 1916 Studebaker cars and the selling campaign. It was shown that sales in this district have been far ahead of those of 1914, and the future looks even brighter.

More War Truck Orders

Large Contracts Reported for Jeffery, White, Peerless and Morton Cos.

NEW YORK CITY, June 1—Large war orders have been received by several of the truck manufacturers. The Thomas B. Jeffery Co., Kenosha, Wis., received an order of 1,250 trucks from the French Government. These have practically all been delivered and consist of 200 Jeffery Quads, 1,000 $\frac{3}{4}$ -tonners, and fifty 1 $\frac{1}{2}$ -tonners.

Hitherto most of the trucks had gone to Russia. The Canadian contingents, the Belgian army and the British expeditionary force also have a number of Quad trucks in service at the front, amounting to over 100.

The Jeffery factory is working night and day on three 8-hour shifts and has been for several weeks past. At present the company is shipping to several South-American countries and most of the big European countries, Siberia, Manitoba and Australia. An order for trucks was recently received from the dealer at Copenhagen, Denmark.

The White Co. has received an order for 300 tank trucks for the Russian army, to be used as tenders for the active vehicles at the front and for the transportation of gasoline to the bases. The order will amount to about \$1,000,000. The trucks each have a capacity of 1,200 gallons of gasoline and 300 gallons of oil. It is said that the White company recently filled a similar order for the French.

It is reported in Cleveland, unofficially, that the Peerless company has recently received war orders to a total value of \$6,000,000.

In the early part of May the Morton Truck & Tractor Co., Harrisburg, Pa., acquired facilities to begin work on tractors, trucks, and armored cars to the value of \$1,200,000 for the Russian and

British Governments. Arrangements were consummated with the Harrisburg Mfg. & Boiler Co. for manufacturing space.

The Gramm Motor Truck Co. has closed contracts with the British Government for trucks valued at \$2,000,000. A representative of the British Government is said to be supervising the construction at the company's plant in Lima, O.

Russia Buys American Cars

NEW YORK CITY, May 31—W. V. Logan, of the Goodyear Tire & Rubber Co., who recently returned from Russia, states the Russian Government is fast introducing the American automobile and has been a heavy buyer since the war started. When the war started there were only 12,500 motor vehicles in Russia. The government purchased between \$15,000,000 and \$20,000,000 worth of new machines while Mr. Logan was in that country.

Few Market Changes

NEW YORK CITY, May 31—Few changes occurred in this week's market quotations. Most of these were in the metals markets which were featured by the advance of \$5 per ton of lead. This metal showed a gradual rise from Thursday on, closing on Monday at \$4.75 per 100 pounds. Aluminum this week was stronger at 25 cents a pound, a gain of 2 cents. Electrolytic copper fluctuated throughout the week and closed at 18 1-2 cents without any change. Open-hearth steel went up 50 cents a ton. Tin rose 25 cents per 100 pounds.

Up-river Para rose 1 cent. Trading was dull and the offerings were light. The petroleum market remains steady; linseed oil is quiet.

Sparton Horn on 1916 Packard

NEW YORK CITY, May 31—The Packard Motor Car Co., Detroit, Mich., has adopted the Sparton signal as regular equipment on its 1916 cars.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Week's Changes
Aluminum . . . . .	.23	.23	.24	.25	.25	+ .02
Antimony . . . . .	.35	.34	.35	.34	.34	— .01
Beams & Channels, 100 lbs	1.31	1.31	1.31	1.31	1.31	.....
Bessemer Steel, ton	19.00	19.00	19.00	19.00	19.00	.....
Copper, Elec., lb. . . . .	.18 1/2	.18	.18	.18 1/2	.18 1/2	.....
Copper, Lake, lb. . . . .	.18 1/2	.18 1/2	.18 1/2	.18 1/2	.18 1/2	.....
Cottonseed Oil, bbl.	6.20	6.20	6.20	6.33	6.30	+ .10
Cyanide Potash, lb. . . . .	.24	.24	.24	.24	.24	.....
Fish Oil, Menhaden, Brown . . . . .	.41	.41	.41	.41	.41	.....
Gasoline, Auto, bbl. . . . .	.12	.12	.12	.12	.12	.....
Lard Oil, prime . . . . .	.90	.90	.90	.90	.90	.....
Lead, 100 lbs	4.30	4.30	4.40	4.50	4.75	+ .45
Linseed Oil . . . . .	.67	.67	.67	.67	.67	.....
Open-Hearth Steel, ton	19.00	19.00	19.00	19.00	19.50	+ .50
Petroleum, bbl., Kans., crude . . . . .	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.35	1.35	.....
Rapeseed Oil, refined . . . . .	.82	.82	.85	.85	.85	+ .03
Rubber, Fine Up-River, Para . . . . .	.60	.60	.61	.61	.61	+ .01
Silk, raw, Ital. . . . .	..	..	3.90	..	..	.....
Silk, raw, Japan . . . . .	..	..	3.45	..	..	.....
Sulphuric Acid, 60 Baume . . . . .	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	37.75	37.25	37.25	37.75	38.00	+ .25
Tire Scrap . . . . .	.05	.05	.05	.05	.05	.....

War Halts Trade in Italy

Plants Busy on Army Orders for Cars, Motor Trucks and Tractors

PARIS, May 13—According to a correspondent who has just returned from a tour of inspection of the automobile factories of Italy, the private automobile trade of that country is at a standstill. During the early stages of the war the Italian factories supplied a considerable amount of automobile material to Germany, the Fiat company in particular furnishing 1,500 trucks. This business has now been stopped, for the works have been given important orders for the Italian army. Fiat is particularly busy on six-cylinder aviation motors declared to be an exact copy of the Mercedes aviation engine. France has made arrangements to supply Italy with an immense number of aeroplanes. Isotta-Fraschini is building automobiles and light trucks for the war department. The former Italian Darracq factory is working on gasoline tractors for the haulage of heavy guns across country.

Federal Truck Capital Increased to \$500,000

DETROIT, MICH., May 27—Five years ago in June, the Federal Motor Truck Co., was started with a capital stock of \$100,000. This was doubled about 2 years ago. Now the company has increased it from \$200,000 to \$500,000.

The business of the Federal company has been increasing very rapidly lately and it has been found necessary to enlarge the plant, to add new machinery and to increase the working force, to take care of the rush of orders, promptly. For the present, the expansion will consist in adding one story to the main plant, which means an addition 300 by 60 feet.

There has never been such a rush at the plant, officials say. Business has been coming from all parts of the country and there is no sign of any letting up. Secretary and sales director, J. F. Bowman recently returned from an extended trip through New England, and reports the truck business to be the best it ever was. From other sections in the country Federal distributors report a similar condition.

Ten to twelve trucks are made daily at the present time, but this production will be increased 50 per cent. when the additions to the plant are completed.

Independent Motors Increases Capital \$60,000

PORT HURON, MICH., May 28—The Independent Motors Co., formerly the Cass

THE AUTOMOBILE

Security Prices Higher

Market, However, Dull—International Uncertainties a Restraining Factor

NEW YORK CITY, May 31—The stock market is dull and waiting, pending further developments in the controversy between the United States and the German government. Still, the market continues to exhibit a good tone. The volume of trading in the stock market on Saturday was small and the dealings seemed to be devoid of significance. Automobile securities were a little higher this week, there being few declines.

Most of the tire issues went up. Good-year common rose 15 points; Kelly-Springfield common and first preferred, 3 and 1 1-2 points; Swinehart 1-2 point; and U. S. Rubber common and preferred, 1 and 3-4 points, respectively.

Automobile stock prices in general showed a higher tendency. International Motor common and preferred rose 2 and 4 points, respectively; Maxwell common, first preferred, and second preferred, rose 3 1-2, 4 and 3 points, respectively; Studebaker common and preferred went up 2 and 1 1-2 points; and Willys-Overland common and preferred showed a gain of 3 1-2 and 7-8 points.

Dividends Declared

CLEVELAND, O., May 28—The Peerless Motor Car Co. has declared a regular quarterly dividend of 1 3-4 per cent. on the preferred stock, and 3 1-2 per cent.

additional on account of accumulated dividends. Both dividends are payable July 1 to stock of record June 20. The dividends had been suspended April, 1914.

The declaration of the total 5 1-4 per cent. on the preferred places the stock on its regular 7 per cent. basis, and makes up two of the four dividends which were unpaid.

DETROIT, MICH., May 31—The Packard Motor Car Co. has declared the regular quarterly dividend of 1 1/4 per cent. upon the preferred stock, payable June 15 to stockholders of record upon the close of business the first day of June, 1915.

NEW YORK CITY, May 31—The Rubber Goods Mfg. Co. has declared the regular quarterly dividend of 1 1/4 per cent. on the preferred, and a dividend of 1 per cent. on the common stock, payable June 15, to stock of record of June 8.

EAST PALESTINE, O., May 29—The McGraw Tire & Rubber Co., East Palestine; 5 per cent. semi-annual dividend on common stock, payable June 1.

Remy Preferred Stock All Redeemed

ANDERSON, IND., May 31—The Remy Electric Co., Anderson, Ind., has filed notice that all of its preferred stock has been redeemed.

Wilcox-McKim Files Petition

DETROIT, MICH., May 31—The Wilcox-McKim Co., Saginaw, Mich., automobile parts manufacturer, filed a voluntary petition in bankruptcy giving its liabilities as \$16,000 and its assets as \$24,000. A reorganization is planned.

Automobile Securities Quotations on New York and Detroit Exchanges

	1914 Bid Asked	1915 Bid Asked	Wk's Ch'ges
Ajax-Grieb Rubber Co.	220 ..	300 ..	..
Ajax-Grieb Rubber Co. pfd.	99 ..	101 ..	..
Aluminum Castings pfd.	98 100	98 100	..
J. I. Case pfd.	85 87	.. ..	..
Chalmers Motor Co. com.	101 ..	89 91	-1
Chalmers Motor Co. pfd.	92 ..	95 97	..
Electric Storage Battery Co.	52 53	48 ..	..
Firestone Tire & Rubber Co. com.	306 310	475 480	..
Firestone Tire & Rubber Co. pfd.	106 109	110 112 1/2	..
General Motors Co. com.	93 1/2 94	135 136 1/4	+1
General Motors Co. pfd.	93 1/2 94	98 100	+1
B. F. Goodrich Co. com.	25 26	43 45	-1
B. F. Goodrich Co. pfd.	88 89 1/2	101 1/4 102	-1/4
Goodyear Tire & Rubber Co. com.	170 176	240 ..	+15
Goodyear Tire & Rubber Co. pfd.	98 1/2 100	105 106	..
Gray & Davis, Inc. pfd.	95 102 1/2	.. ..	..
International Motor Co. com.	.. 5	14 15	+2
International Motor Co. com.	3 10	34 38	+4
Kelly-Springfield Tire Co. com.	.. ..	82 1/2 85	+1 1/2
Kelly-Springfield Tire Co. 1st pfd.	.. ..	82 1/2 85	+1 1/2
Kelly-Springfield Tire Co. 2d pfd.	.. ..	115 135	..
Maxwell Motor Co. com.	14 1/4 15	42 1/2 44	+3 1/2
Maxwell Motor Co. 1st pfd.	45 46	86 87 1/2	+4
Maxwell Motor Co. 2d pfd.	19 19 1/4	37 38 3/4	+3
Miller Rubber Co. com.	.. ..	180 185	..
Miller Rubber Co. pfd.	.. ..	104 105	..
New Departure Mfg. Co. com.	123 125	136 141	..
New Departure Mfg. Co. pfd.	105 107	106 ..	..
Packard Motor Co. com.	103 ..	.. 104 1/2	..
Packard Motor Car Co. pfd.	98 1/2 100 1/2	.. 100 1/2	..
Peerless Motor Car Co. com.	18 25	.. ..	..
Peerless Motor Car Co. pfd.	.. 62 1/2	.. ..	..
Portage Rubber Co. com.	.. 40	35 38	..
Portage Rubber Co. pfd.	.. 90	85 88	..
*Reo Motor Truck Co.	9 3/4 10 1/4	14 1/2 15 1/2	-1 1/2
*Reo Motor Car Co.	27 28 1/2	32 3/4 33 1/2	-1 1/2
Splidorf Electric Co. pfd.	40 50	.. ..	..
Stewart-Warner Speed. Corp. com.	47 1/2 48 1/2	64 67	..
Stewart-Warner Speed. Corp. pfd.	97 99	103 105	+1
Studebaker Corporation com.	34 35	67 69	+2

*Par value \$10; all others \$100 par value.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE
ACTIVE STOCKS

	1914 Bid Asked	1915 Bid Asked	Wk's Ch'ges
Studebaker Corporation pfd.	88 1/2 90	97 1/2 99 1/2	+1 1/2
Swinehart Tire & Rubber Co.	65 ..	75 80	90
Texas Co.	144 1/2 145 1/2	123 1/2 125	+1 1/2
U. S. Rubber Co. com.	58 1/2 58 3/4	62 64	+1
U. S. Rubber Co. 1st pfd.	102 1/2 103	62 64	+1 3/4
Vacuum Oil Co.	224 226	200 205	+5
White Co. pfd.	107 110	103 108	..
Willys-Overland Co. com.	78 80	114 1/2 116 1/2	+3 1/2
Willys-Overland Co. pfd.	95 95 1/2	100 103	+1 1/2

INACTIVE STOCKS

Atlas Drop Forge Co.	.. ..	21	26
Ford Motor Co. of Canada	.. ..	550 950	1000 +50
Kelsey Wheel Co.	.. ..	193 200	..
W. K. Prudden Co.	.. ..	20 1/2 19 1/2	21 ..
Regal Motor Car Co. pfd.	.. ..	30 ..	25 ..

BONDS

General Motors, notes, 6s, 1915	.. ..	101 102	.. ..
Packard Motor Co., 5s, 1916	.. ..	95 98 1/2	98 1/2 ..

S. G. V. Plant Sold for \$55,600

Probably Will Not Be Continued—Lozier Plattsburg Real Estate Sold

READING, PA., May 29—The automobile plant of the S. G. V. Co., Reading, was sold at the receiver's sale on May 27 to F. L. Metzler, of Newark, N. J., a member of the New Jersey Machinery Exchange, for \$55,600. The sale was conducted by R. E. Graham of Philadelphia, the receiver.

Negotiations are now pending with two or three bidders for the good will and the service department of the company. It is doubtful if it will be continued as a running concern at Reading.

Sell Lozier Plattsburg Plant

PLATTSBURG, N. Y., May 28—A syndicate of Plattsburg business men has purchased the real estate formerly owned by the Lozier Motor Co., in this city. About 75 per cent. of the plant has been sold in lots, bringing in about \$200,000. Some time ago three buildings, included in the Lozier plant here, were sold to S. S. Kempner. Charles Shongood, who acted as the auctioneer, states that the rest of the plant will probably be sold in 2 or 3 weeks.

\$170,000 Bid for Detroit Body Assets Confirmed

DETROIT, MICH., May 27—The sale of the assets, except the receivable accounts, of the bankrupt Detroit Body Co., to the Fisher Body Co., has been confirmed by the United States district court. The latter company bid \$170,000 for the property. It is stated that this money will be sufficient to meet the claims of the preferred creditors, while from the accounts receivable it is anticipated enough will be collected to pay claims of the general creditors. The Security Trust Co. is receiver for the bankrupt concern.

Savidge Steering Device Makes Record

INDIANAPOLIS, IND., May 29—Contracts for 75,000 Savidge devices in about 8 months is the record of the Savidge Steering Device Co. of Indianapolis. This company was organized in September of last year to manufacture a steering device for Ford cars.

Rumely Co. to Be Reorganized

LAPORTE, IND., May 28—It is confirmed that there will be a reorganization of the M. Rumely Co., Laporte, now in the hands of Receiver Finley P. Mount. The note-holders' committee, of which John W. Patten is chairman, has deemed it the

best for the protection of the note-holders, after investigation, to reorganize the concern, provided a plan consistent with their interests can be formulated. In order that the committee may have the authority to represent the note-holders in carrying on the necessary negotiations, the holders of notes have been asked to deposit them with the United States Mortgage & Trust Co., New York City, or its agents, which will issue certificates of deposit. Just what the plan of the reorganization will be can not be told at this time, it will probably take many conferences of those interested before a plan can be arranged.

The company's business continues to increase. The total number of men employed in the company's shops has passed the 1,000 mark. Of these 584 are employed in the shops at Laporte, a gain for the week of twenty-eight men. The others are distributed among the plants at Battle Creek, Richmond, Stillwater and Toronto.

Champion Extends Time Limit of Profit-Sharing Plan

TOLEDO, O., May 31—In order that the dealers who have not as yet signed the profit-sharing agreement of the Champion Spark Plug Co., this city, may have further time to take advantage of that opportunity, the time limit for their acceptance has been advanced from June 1 to July 1, 1915.

It is recalled that when the first announcement was made to the trade, attention was called to the dealer that all he had to do was to fill out the blank which had been mailed to him, or which he could procure through his jobber's salesmen. At the end of the year the company would send the dealer a check representing his pro rata share of the profits which he had earned, and which would be based upon the number of Champion plugs he had purchased during the year.

\$2,000,000 Co. to Manufacture Dual Gear

JACKSON, MISS., May 30—The Orr Modern Motor Car Co., capitalized at \$2,000,000, has been organized at Yazoo City to manufacture a dual gear, multi-speed, gear-driving mechanism for automobiles. The officers are G. A. Wilson, president, and C. D. Orr, the inventor, secretary.

The basic principle of the invention is the worm drive. Power is applied directly to the rear wheels in a straight line, doing away with all but one universal joint and many small parts. In fact, it is said to eliminate two-thirds of the parts now used in transmitting power, to deliver 10 per cent. additional power, and to eliminate noise and jerking, while reducing the cost of maintenance to a minimum.

Springfield Plants on Overtime

Truck, Machine and Tire Factories Rushed — Winton Changes Name

SPRINGFIELD, O., May 28—Two local factories are working overtime to get out the orders on hand for machines and supplies. They are the Robbins and Myers Co., and the Victor Rubber Co. Another one, which is starting in again on a big contract, which will necessitate the employment of a large force, is the Kelly-Springfield Motor Truck Co.

When C. F. McGilvray, president of the Robbins and Myers Co. was asked how his plant was running, he stated that it was running 4 hours overtime in most departments. It is employing about 1,400, which is a larger force than it had last year.

Out at the Victor Rubber works day and night forces are being employed to meet the demands of the trade. Recently the company began the manufacture of pneumatic tires. As a result it has been forced to enlarge its works. The contractors are at work now erecting a large two-story addition, 200 feet long. About half of it is finished.

The Kelly-Springfield Motor Truck Co. is busy with another large order to be filled at once. This one has just been received. More employees will be added to handle it.

Now the Winton Co.

CLEVELAND, O., May 29—Papers have been filed with the secretary of state changing the name of the Winton Motor Car Co., Cleveland, to the Winton Co. No change in the capitalization was made.

Cadillac Ships 2,506 Eights in May

DETROIT, MICH., May 31—During the twenty-six working days of May the Cadillac Motor Car Co. shipped 2,506 eights, or 181 more cars than in April. The total number of cars shipped to date is 10,788. Of this number 288 have been delivered thus far to Detroiters.

DETROIT, MICH., May 29—A new three-story office building will be erected by the Cadillac Motor Car Co.

Buying Moreland Truck Parts in East

LOS ANGELES, CAL., May 26—Watt Moreland, general manager of the Moreland Distillate Motor Truck Co. of this city is in the East purchasing ten carloads of motor truck parts for the Los Angeles factory. Moreland's first day at the Timken plant in Detroit resulted in five carloads of axles and David Brown

worms being shipped West. The Continental Motor Mfg. Co., was also visited and a large supply of truck motors ordered. A large supply of transmissions was purchased from the Brown-Lipe factory at Syracuse. Milwaukee and Lafayette are to be called upon for supplies for the Los Angeles truck factory. Large shipments of pressed steel frames and Ross steering gears will complete the Moreland order.

American Piston Ring Closes Large Contracts

NEWARK, N. J., May 27—The American Piston Ring Co., this city, has closed contracts for the 1916 equipment of the Chalmers Motor Co.; Pierce-Arrow Motor Car Co.; Winton Motor Car Co.; Lozier Motor Co.; F. B. Stearns Co.; L. P. C. Motor Co.; International Motor Co.; Fiat Co., and the Sterling Motor Co.

The American Piston Ring Co. has removed the entire plant to its new factory building at South Eleventh street, this city, which triples its production capacity. Orders on hand will not only keep the plant going at full capacity for 10 hours during the day but also 10 hours three nights per week.

Ten Broeck Tyre Co. Working Night and Day—Equipment Doubled

LOUISVILLE, KY., May 27—During the last 2 months the Ten Broeck Tyre Co., has doubled its equipment and is working a big force both night and day. The company now employs about 500 men.

About 300 tires a day is the present output of the factory. The general revival of trade is being reflected in the business of the local tire factory, which finds its output more than double that of last year, according to an official.

H. L. Lewman, president of the concern, states that the factory is well supplied with crude rubber and expects to increase the present output within a short time.

Austin to Build New Plant

GRAND RAPIDS, MICH., May 29—It became known that Walter S. Austin, president of the Austin Automobile Co., has decided to build a new plant, probably on South Division avenue. Details are withheld for the present.

\$100,000 Plant for Maxwell in Dayton

DAYTON, O., May 29—The Maxwell Motor Co. plant in this city will be enlarged through an addition, to be 160 by 100 feet in size, at an expenditure of about \$100,000.

Chalmers Four-Story Addition

DETROIT, MICH., May 29—A four-story addition, 60 by 90 feet, will be erected by the Chalmers Motor Co., to increase the capacity of the machine shops.

Ford Reduces Prices on Parts

Reductions Range From 10 to 25%—Stearns Business Gains 50%

DETROIT, MICH., June 1—*Special Telegram*—The Ford Motor Co. has announced a reduction on most of its parts ranging from 10 to 25 per cent. A few parts, however, which it was found cost more to manufacture now than heretofore, were increased in price. For instance, the front axle assembly now costs \$24 instead of \$22. On the other hand, the rear axle assembly, which formerly listed at \$60, now costs \$55. Radiators have been reduced from \$20 to \$15, and fenders from \$3 to \$2.50.

Stearns Shows 50% Increase

CLEVELAND, O., May 28—The F. B. Stearns Co., this city, increased its business during the first week of May 50 per cent. over the corresponding week in 1914. During March and April of this year there was an increase of 25 per cent. over the same months in 1914.

Portage Takes Over Barberton Plant—To Build New Factory

CANTON, O., May 28—A deal has been closed whereby the Portage Rubber Co. has taken over the plant of the American Strawboard Co. in Barberton, O., for the purpose of converting it into a rubber plant. A new plant will be erected on the site and the old plant will be used as a reclaiming plant. The Portage Rubber Co. was organized in 1911. The principal product of the company is automobile tires and tubes, although other rubber articles are manufactured.

Houpt Takes Hudson Agency

NEW YORK CITY, June 1—The Hudson Motor Car Co. of New York today took over the distribution of the Hudson cars in the Metropolitan District, formerly handled by the A. Elliott Ranney Co. H. S. Houpt is president of the company.

The service station for the cars will be continued at 64th street and Broadway. The local salesroom at that address will be removed to the Circle Building, Broadway and Columbus Circle. The Brooklyn salesroom for Hudson cars, at 1184 Bedford avenue, under the name of the A. Elliott Ranney Co., will be continued as the Brooklyn salesroom of the local company.

\$600,000 Oil Refinery for Gainesville

GAINESVILLE, TEX., April 30—An oil refinery to cost approximately \$600,000 is to be erected here by the Producers'

Refining Co., which is now being organized. The stock of the new company is held principally by F. H. Thwing, of Kansas City, Mo.; H. M. Ebans, of Pasadena, Cal.; Thomas H. Smith, of Denver, Col., and George A. Todd, of Ponca City, Okla. These men and their associates have contracted with a number of oil producers of the Healdton, Okla., field to purchase a minimum of 6,000 barrels of oil per day for a period of 5 years. The producers who are parties to this contract have taken stock in the new company and will pay for it in oil.

To Enlarge Bailey Gearless Differential Production

SYRACUSE, N. Y., May 28—The New Process Gear Corp., this city, has entered into a contract with the Gearless Differential Co. of Detroit, to manufacture the Bailey gearless differential for the trade.

The present policy of going after replacement business on cars already in service, will be continued.

Oakland Daily Output to 45 Cars and Still Growing

PONTIAC, MICH., May 28—The output of the Oakland Motor Co., which has been of an average of thirty-five cars a day, will be increased to forty-five a day beginning next week. This will be increased steadily through the increase of the working force until the output reaches 100 cars a day.

Cornelian Plant Working to Capacity

ALLEGAN, MICH., May 27—With a force of 248 men the Blood Bros. Machine Co., which make the Cornelian cars, is now working to its full capacity. The men are working 24 hours a day, there being three shifts. A schedule has been laid out for a minimum output of twenty-five cars a week, but this will gradually be increased. The first two demonstrators were shipped to dealers last week.

King Drive-Away Day June 10

DETROIT, MICH., May 28—The King Motor Car Co. has arranged for the first drive-away of eight-cylinder cars. This is to take place June 10, and purchasers of King cars from New York, Pennsylvania, Virginia, West Virginia, Ohio, Indiana, Michigan and Ontario have advised the company that they will be there to take delivery of their cars.

Autocar Sales Increase 40 Per Cent

ARDMORE, PA., May 31—Sales of Autocars have increased 40 per cent. during the past 5 months, according to a statement of the Autocar Co., this city. This increase has come from all branches throughout the United States and is made up entirely of domestic sales.

\$50,000 in Prizes for Sheepshead

Track Will Be Completed September 1, When Entries Close—Flying Start

NEW YORK CITY, May 27—The opening of the new 2-mile Sheepshead Bay speedway, New York City, will without doubt take place on Saturday, October 2, with a race for which twelve cash prizes totaling \$50,000 will be offered, New York City thus opening with a motor racing classic the equal of any yet staged in the country. President Carl G. Fisher, who is also president of the Indianapolis speedway gave his sanction to this program which differs but little from the Indianapolis one. Instead of ten prizes given at Indianapolis there will be twelve with \$20,000 to the winner, \$10,000 to second, \$6,000 to third, \$3,000 to fourth and \$2,500 to fifth. The last seven prizes are, \$1,600; \$1,400; \$1,300; \$1,200; \$1,100; \$1,000; and \$900.

The exact hour of starting is not yet known, but the start will be a flying one as used at Indianapolis, and President Fisher has agreed to pace the front row of starters. Eliminating speed trials will undoubtedly be held on the Saturday afternoon previous to the race and the following Monday. In addition to eliminating speed trials there may be a special event such as a pursuit race or other attractions.

Entries Close Sept. 1

Entries will close September 1, the fee being \$200 per car which is returned if car starts. Owing to the use of a board track it will be necessary for all cars to carry approved mud aprons so that grease cannot leak onto the boards. The usual changing of steering spindles and parts prior to the race will be insisted upon, but the changing of the axle proper will not be required.

Rush Work Night and Day

Work is at present being pushed night and day on the erection of the speedway and it will be finished in ample time for the meet.

Detroit Electric Starts on 1,500 Mile Run

DETROIT, MICH., May 28—A practical demonstration of what the electric vehicle can do has been arranged by the Anderson Electric Car Co., on a scale never before attempted with an electrically driven automobile.

Beginning June 1 a stock model 52 Detroit electric brougham, seating five passengers, with Detroit lead batteries, Houk wire wheels and Goodrich

Silvertown cord tires, will start a series of twenty daily runs to places of interest around Detroit. The daily mileage will be at least 75 miles, so all told 1,500 miles to be run between June 1 and 23.

The Anderson company wants to demonstrate by this series of runs that the electric car is a practical family vehicle, of easy operation and that it can stand severe road driving, just as the gasoline car.

A committee of three Detroit newspaper men will act as supervisors of the runs, and Secretary Charles A. Hughes, of the Detroit Athletic Club, will send the car away daily from the club house and check it upon its return. The day's run must be made on one battery charge.

In addition to the driver and a representative of the Anderson company, there will be room for three more passengers in the car. The company has extended an invitation to any one interested to take part in one or several trips. In fact the manufacturers are desirous that prospective purchasers take part in the runs as they believe the demonstration will be the very best argument in favor of the electric's practicability.

Although the twenty runs will be made to cities and towns it has been arranged to have basket luncheon by the roadside as often as the weather will permit this.

Stutz Stars at Newark Track

NEWARK, N. J., May 31—Joe Dickinson, in a Stutz, carried off the honors in today's automobile races on the 1-2-mile track at Olympic Park, held by the Matty Matthews Auto Racing Assn., Inc., by taking four out of the six events. The attendance was 5,000. The results of the races follow:

One-Mile Time Trials (free for all)—Won by Dickinson, Stutz; Frazer, Correja, second; Duryea, Ford Special, third; time, 1:12 1-5.

Two-Mile Special Invitation (Class E)—Final heat won by Dickinson, Stutz; Watson, Mercer, second; Frazer, Correja, third; time, 2:39 4-5.

Five-Mile Non-Stock (Class E)—Won by Watson, Mercer; Frazer, Correja, second; Vail, Otto, third; time, 6:36 3-5.

Two-Mile Non-Stock (Class D)—Final heat won by Dickinson, Stutz; Lambert, Stutz, second; Watson, Mercer, third; time, 2:41 1-5.

Five-Mile Handicap, Non-Stock (Class E)—Won by Lambert, Stutz; Vail, Otto, second; Murchil, National, third; time, 6:51 3-5.

Special Professional Australian Pursuit Race (Class E)—Won by Dickinson, Stutz; Frazer, Correja, second; Vail, Otto, third; distance, 4 3-4 miles.

Galesburg Entries to Date Number Five

GALESBURG, ILL., May 28—Five entries are in for the 100-mile race by automobiles on the Galesburg Fair Assn. grounds on June 9, and many more are looked for. Those already registered include the following: Tom Alley, driving a Dusenberg; Ed. O'Donnell, a Dusenberg; S. Ostewid, an Apperson Special; Jack Dody, a Crown Special; and Andy Burt, a Stutz. It is expected that two Maxwells will be entered.

100 M. P. H. on Tacoma Speedway

Track Finished May 24—Boarding Cost \$55,000—16 Entries —\$10,500 in Prizes

INDIANAPOLIS, IND., May 29—Manager G. D. Dunn of the Tacoma Speedway Assn., Tacoma, Wash., who is here attending the speedway races, says that the boarding of the 2-mile Tacoma speedway was completed May 24, and that already one car has lapped it at an unofficial speed of over 100 miles per hour. This speedway is located on a 230-acre tract 6 miles from the heart of the city and was used last year with a gravel surface. In boarding, the 2 by 4 material has been laid directly on the gravel, without intervening sleepers, the 2 by 4's lying in the direction of travel and placed 5 inches apart with the intervening spaces filled with gravel and the entire top covered with a layer of liquid asphalt 1-8 inch thick. The boarding cost \$55,000.

The track is 50 feet wide and banked at the turns so that the outer edge is 18 feet high, the banking all being gravel. The homestretch is 60 feet wide to care for the pits at the starting line.

This track is not a perfect oval being longer on one side than the other, the straightaway on the homestretch measuring 2,700 feet and that on the backstretch 1,800 feet. On one end is a straight of 700 feet and 800 feet on the opposite end. The grandstand accommodates 9,500. Twenty-seven cars can be started according to A.A.A. rules and to date sixteen entries are in.

The total of \$10,500 in prizes is divided up among three races covering 2 days as follows: 100-mile race, \$1,500; 200-miles, \$3,500; and 250-mile race \$5,500.

One Set of Goodyear Tires on Transcontinental Stutz

NEW YORK CITY, May 31—The transcontinental Stutz Bearcat which recently broke the coast to coast record by covering the 3,728.4 miles between San Diego, Cal., and this city in 11 days, 7 hours and 15 minutes, completed the trip on a single set of Goodyear tires, the same air being in the front pair at the finish of the run. Other features of equipment were mentioned in THE AUTOMOBILE for May 20.

Demonstrates Advantages of Use of Sub-Casings in Tires

LOS ANGELES, CAL., May 29—For the purpose of demonstrating the advantages derived from tires that are equipped with sub-casings, the Western Auto Sub-Casing Co., of this city is conducting a novel test.

The company installed a machine which duplicates the duties imposed on tires in usual running. The machine consists of a high speed rasp wheel to give friction; and a wheel with inflated tire applied to the rasp with pressure on the tire. This pressure is equivalent to the weight of the car and places approximately the same weight on the tire as when it is on the road.

The machine demonstrated that the tire equipped with a sub-casing did not blow out as soon as the one not reinforced.

Saxon Averages 37 M.P.G. for 4,665 Miles

DETROIT, MICH., May 27.—The 30-days' reliability and consumption test which was started April 26 by a four-cylinder stock Saxon roadster ended today. The little car was kept actually 32 consecutive days on the road and covered in that time 4,665 miles or an average of 145.8 miles a day.

The total expense for gasoline and oil was \$25.07 or an average of \$0.0053 per mile. The expense consisted of \$13.97 for 127 gallons of gasoline and \$11.10 for 63 quarts of lubricant. This consumption represents an average of 37 miles per gallon of gasoline and 74 miles to the quart of oil.

During more than half of the time the test was under way, it rained and the roads were at times in very bad condition. The car followed two routes on every alternating day, being checked by city officials out of Detroit and by officials of the Wolverine Automobile Club daily in this city.

Sioux City Getting Ready

SIOUX CITY, IA., May 27—Improvements are being made on the 2-mile speedway here for its coming meet July 3, by increasing the banking on the turns 2 feet and using 20,000 additional gallons of oil as compared with last year. A new bleachers' grandstand to accommodate 1,800 has been erected on the back stretch. The track surface of this speedway is 70 feet wide with the exception of the homestretch which is considerably wider.

To Nationalize Traffic Rules

CINCINNATI, O., May 31—Formation of plans for the adoption of national traffic rules was advocated at the annual meeting of the International Assn. of Police Chiefs which was held in Cincinnati, O., last week. C. E. Healy, chief of Chicago, declared that the pedestrian was hardest to control, but that he has partially solved the problem in his city by securing the co-operation of business men. He advocated safety zones for pedestrians. The importance of automobiles in police work was also discussed at length.

Two Shows for Columbus

First, Aug. 30 to Sept. 3—

Second, Jan. 29 to Feb. 5—

Jitney Developments

COLUMBUS, O., March 28—In order to put the business of operating automobile shows in the Buckeye Capital on a business basis, the Columbus Automobile Show Co. has been incorporated with a capital of \$1,200 for the purpose of giving all kinds of automobile and accessory displays. The stockholders of the corporation consist of twelve of the well-known dealers of the city, each of whom will hold one share of the stock. The company will be operated for profit, similar to other commercial incorporations and if any profit is made it will go into the pockets of the stockholders, who are the exhibitors.

It is planned to give two automobile shows during the coming 8 months. The first, which will be known as the autumn show will be held in the South Machinery Hall at the Ohio State Fair and will be held August 30 to September 3 inclusive, the same dates as the state fair. All displays of automobiles, motor trucks or accessories must be in that building, which has been leased by the show company from the Ohio Agricultural Commission.

The second annual automobile show will be held in the Memorial Hall, January 29 to February 5 inclusive and will be similar to previous shows. Displays of passenger cars, commercial vehicles and accessories will be made.

Neutral in New Jersey Jitney War

TRENTON, N. J., May 28—The State Motor Vehicle Department issued a proclamation of neutrality today in the war between trolley companies and jitney operators.

The proclamation was the outcome of a complaint brought before Commissioner Dill by the Trenton and Mercer County Traction Corp. against G. P. Gibson, who had driven a jitney past a standing trolley car. The defendant was discharged.

Louisville Jitney Bond Clause Void

LOUISVILLE, KY., May 29—Circuit Judge Samuel B. Kirby today declared void the clause in the jitney bus ordinance relating to bonds required of owners and operators and granted a temporary injunction prohibiting the City of Louisville from enforcing the measure. The temporary order was granted on the application of seventy-three jitney bus operators, and will be continued in effect

until the action can be tried out on its merits.

The court does not hold that the bond of \$5,000 required by the ordinance is excessive, but says that the section held invalid provides for something more than a bond of \$5,000, and that in inserting this extra provision the General Council exceeded its authority.

Cannot Regulate Jitneys in Massachusetts

BOSTON, MASS., May 31—The attempt of the street railway magnates to curb the jitney bus business in Massachusetts got a jolt here when Attorney-General Atwill at the request of the legislature sent down an opinion that the proposed law to govern them was unconstitutional. This was such a surprise that there is some doubt now whether there will be any legislation at all this year governing the buses. And even if there is some law passed there is a possibility of confusion because one section of the motor law now states specifically that no city or town shall pass ordinances restricting motor vehicles. At present any such regulations as restrict the vehicles are illegal, but no one has discovered it, or made any attempt to modify the matter.

3-Cent Jitney Offered for N. Y.

NEW YORK CITY, June 1—Three bids for the new bus routes in Manhattan were received by the franchise committee of the Board of Estimate today and opened by Acting Mayor McAneny. The Fifth Avenue Co. wants a 10-cent fare, the Motor Bus Co., both 5- and 10-cent fares, and Messrs. Brunner and Ridley, of 405 Pearl street, representing a concern not yet organized, a 3-cent fare for each of three zones.

The Motor Bus Co. promises to have 100 buses going within 6 months. The Brunner-Ridley representatives state that operation would begin within 4 months with buses of 3 tons capacity, either propelled by electricity or gasoline, or both.

Supreme Court Upholds Validity of Florida Automobile Tax

ATLANTA, GA., May 29—Florida may now be added to the list of states whose laws for the taxing of automobiles have been upheld by the highest tribunal in the land. In Florida, the state statutes fix a license tax of \$3 on each car. Automobile owners, after paying that, contended they should not be required to pay a further tax, in some places being subjected to separate city and county taxes as well, and went to the courts, but the supreme court has ruled against the plaintiffs.

The Week in the Industry



Brown Joins Los Angeles Pierce—J. S. Brown, who has been connected with the automobile industry in Southern California for several years, has joined the forces of the W. E. Bush organization, Southern California distributor for the Pierce-Arrow line in Los Angeles, Cal. Brown will devote his time to the management of the used-car department, which is located adjoining the main Bush salesroom on South Grand avenue.

New Man in Los Angeles Apperson—M. H. Green has been appointed retail sales manager of the Los Angeles Apperson branch. Green was for 6 years manager of the Cadillac and 3 years sales manager of the Hudson agency in Los Angeles. F. M. Headlee, former manager of the Chalmers agency in Los Angeles, has assumed the duties of wholesale manager of the Apperson branch, which covers the entire territory of Southern California and Arizona.

Garage

Goodyear's New Booklet.—A new booklet on "Goodyear Fortified Tires" has been issued to the trade by The Goodyear Tire & Rubber Co., Akron, O. It is primarily a booklet discussing big car requirements, and is intended to illustrate the progress Goodyear has made in the car field in the past few years, by dwelling on the two types of tires that exemplify its work.

Motor Men in New Roles

Symons Saginaw Fisk Mgr.—The Fisk Rubber Co., Chicopee Falls, Mass., has opened a branch in Saginaw, Mich., at 812 Genesee avenue, in charge of H. E. Symons.

Titus Joins Owen Magnetic—E. S. Partridge, sales manager of the Owen Magnetic Co., New York City, has added Fred J. Titus to the staff. Titus was recently with the Simplex company.

Eitzen Savage Tire Mgr.—H. H. Eitzen has been appointed manager of the San Diego, Cal., branch of the Savage Tire Co. He was with the Goodrich company for several years, and previous to that time was engaged in the tire business in Idaho.

Wolfe Transferred to Dallas—M. C. Wolfe, former salesmanager for the Kiesel-Kar Co., has been made manager for the company at Dallas, Tex. He succeeds B. M. Lindsey, who resigned only a few days ago to become vice-president and general manager of the M. & S. Sales Co.

Pearson Makes Change—George Pearson, Jr., formerly of the Pearson Motor Car Co., San Francisco agent for the Maxwell cars, has disposed of his interests in the company to the R. & S. Corp. and has taken the Northern California agency for the Saxon Motor Car Co. of Detroit.

Westman in Accessory Business—E. E. Westman, who for the past 5 years has been connected with the Cole Motor Car Co. and Premier Motor Mfg. Co. in the capacity of purchasing agent, has severed his connection with the latter company to embark in the wholesale accessories business on his own account under the name of Standard Bearings & Parts Co. with headquarters in Indianapolis.

Johnson Goes to Seattle—Mel Johnson, who for some years past has been manager of the Howard Automobile Co., Buick distributor, branch at Portland, Ore., has resigned to give all his time and attention to the Seattle Buick agency, in which he secured an interest some 2 years ago. He will be succeeded by G. H. McCutcheon, who is at present manager of the Howard branch in Oakland. C. M. Reese, McCutcheon's assistant, will take charge of the Oakland branch.

Dealer

Recent Visitors to Studebaker Plant—Recent visitors to the plant of the Studebaker Corp., Detroit, Mich., were W. S. Williams, branch manager of the Studebaker agency in Dallas, Tex.; J. Wollaeger, of the Wollaeger Auto Sales Co., Milwaukee, Wis., and A. H. Pearsall, branch manager of the Studebaker Corp., Chicago, Ill., and L. Markle, president of L. Markle & Co., Chicago, Ill.

The Automobile Calendar

June 3.....	New York City, 11th Annual Automobile Outing for Orphans; Orphans' Auto. Day Assn. of N. Y.	July 3.....	Sioux City, Ia., 300-Mile Race, Sioux City Speedway Assn.	Sept. 8-11.....	Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
June 3.....	New York City, N. A. C. C. Annual Meeting.	July 4.....	Visalia, Cal., Road Race; Tulare County Automobile Assn.	Sept. 13.....	Oakland, Cal., Pan-American Road Congress.
June 7-11.....	San Francisco, Cal., National Electric Light Assn.	July 4-5.....	Tacoma, Wash., Road Race, Tacoma Speedway Assn.	Sept. 17-18.....	Peoria, Ill., Illinois Garage Owners' Assn. Convention.
June 9.....	Galesburg, Ill., 100-Mile Race, Galesburg District Fair Assn.	July 5.....	Omaha, Neb., Speedway Races, Omaha Motor Speedway.	Sept. 20-25.....	San Francisco, Cal., International Engineering Congress.
June 11-12.....	Effingham, Ill., Hillclimb and Fuel Economy Test, Salt Creek Hill, Effingham Automobile Club.	July 5.....	Visalia, Cal., Road Race, Tulare Co. Auto. Assn.	Oct.....	St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
June 12.....	Brighton Beach, Track Race; E. A. Moross.	Aug.....	Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.	Oct. 1.....	Minneapolis, Minn., Track Race, Twin City Motor Speedway Co.
June 14.....	San Antonio, Texas, Jitney Convention.	Aug. 2-3.....	San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.	Oct. 1-2.....	Trenton, N. J., Track Races; Inter-State Fair.
June 14-17.....	Detroit, Mich., Summer Meeting of the Society of Automobile Engineers and Start of Cruise to Georgian Bay.	Aug. 20-21.....	Elgin, Ill., Road Races.	Oct. 2.....	New York City, Sheepshead Bay Motor Speedway Track Meet.
June 15-17.....	Chambersburg, Pa., Run to Atlantic City.	Sept.....	Indianapolis, Ind., Fall Show, Indiana State Fair.	Oct. 6-16.....	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
June 19.....	Chicago, Ill., 500 - Mile Race, Chicago Speedway.	Sept.....	Peoria, Ill., Second Northwestern Road Congress.	Dec. 31.....	New York City, Show; Grand Central Palace.
July 3.....	Utica, N. Y., Hill Climb, Automobile Club of Utica.	Sept. 6.....	Providence, R. I., Speedway Race; F. E. Perkins.	Jan. 22, 1916.....	Chicago, Ill., Show; Coliseum.
		Sept. 6.....	Detroit, Mich., Speedway Race; Detroit Speedway Club.	March.....	Boston, Mass., Truck Show, Mechanics Bldg.

Polack Tire in Detroit—The Polack Tyre Co., New York City, has opened a Detroit store at 605 Woodward avenue.

Moves into New Quarters—The Springfield Buick Co. has moved into its new salesrooms and service station at 650 Main street, Springfield, Mass.

A Carload of "Velvets"—The John W. Blackledge Mfg. Co., Chicago, has shipped a carload of shock absorbers to E. A. Patterson, distributor for Kansas.

Chicago Battery Office Moved—General Lead Batteries Co., Newark, N. J., announces the removal of its Chicago office to 219 East Twenty-fourth street.

Wheeler & Schebler Branch Moved—Wheeler & Schebler have moved their Chicago branch to 2021 Michigan avenue with larger and better accommodations.

Vining Has Moved—R. W. Vining, who handles the Paterson car in the New England territory, with headquarters in Boston, Mass., has moved from 320 Newbury street to 16 Columbus avenue, in the Motor Mart.

New Horseshoe Tire Dealer—The Racine Auto Tire Sales Co., Indianapolis, Ind., has opened a salesroom at 60 West New York street, and will act as state distributor for the Horseshoe tires, which are made by the Racine Auto Tire Co.

New Detroit Supply Cos.—The Auto Supply Store, Detroit, Mich., has opened for business at 680 Woodward avenue, with a complete line of accessories and supplies. The Detroit Distributing Co. has opened quarters at 799 Woodward avenue.

Baltimore's New Public Garage—Frank Baumeister has completed a public garage, up to date in every particular, at 13 South Bethel street, Baltimore, Md. Obstructing pillars are eliminated and the place has been fitted with many labor-saving devices.

Chevrolet at New Haven—The Chevrolet Motor Co. has opened a branch at 226-228 George street, New Haven, Conn., and J. H. Whalley, for the past 4 years with the Hartford Buick Co., has been appointed manager, with Edward Burns in charge of sales.

Goodyear Closes N. Y. Retail Store—The Goodyear Tire & Rubber Co. has discontinued its Broadway retail store in New York City. It has opened a service station at 207 West 50th street. Business will continue under the direction of P. W. Smith, present branch manager.

Takes on Miller Tire—The Knight Garage, Inc., at 249-263 George street, Manchester, N. H., has just taken the Miller tire agency as another of its accessories. The garage is being rebuilt and it will handle the Stewart-Warner speedometer service when the work is finished.

Leavitt's New Bldg. Completed—The

four-story building erected by J. W. Leavitt & Co., Seattle, Wash., Pacific Coast distributor of Overland cars, was completed this week. It provides a total floor-space of 36,000 square feet and is one of the largest and best equipped automobile establishments on the Pacific Coast.

Start Their Own Firm—Edward N. Tarbell, for the past 7 years manager of the Post & Lester Co.'s Springfield, Mass., branch, and B. Waters, manager of the Albany and Worcester branches of the company, have formed the Tarbell-Waters Co., at Springfield, Mass., and opened an accessory store at 275 Bridge street, carrying a large line.

New Oklahoma City Co.—The Oklahoma Tire Construction Co. is a new establishment in Oklahoma City, Okla., having opened up at 202 West Second street to reconstruct tires. Another new concern is the Oklahoma Rubber Co. that has opened at 623 North Broadway. This company will make a specialty of quick tire repair service to all motorists in trouble around the city.

Will Operate Own Repair Dept.—C. E. Cain & Son, operating a garage at Wau-paca, Wis., and leasing the repair shop to outside parties, has decided to establish its own repair department and also an accessory and supply store. Tom Halverson, former occupant, has arranged for space with the A. M. Hanson Garage Co. and will operate not only a shop but a selling agency and supply department.

Seattle Co. Moves—Rothweiler & Co., Seattle, Wash., distributor of Cole automobiles in the Puget Sound country and sub-agents for the Ford in Seattle, has moved into its new two-story brick building at Denny Way and Broadway.

Jones Auto Lock in Tacoma—Ben Wold, secretary of the Griffith Motor Car Co., distributor of Dodge cars in Tacoma, Wash., has taken the agency for the Jones Auto Lock.

Invading Milwaukee's Residential Section—One of the oldest and finest residences in Milwaukee, at the northwest corner of Grand avenue and Eleventh street, is being razed to make way for a business block, the first tenant to be the Auto Mart, now located at 225 West Water street, with a Ford branch at 809 Grand avenue. The Auto Mart has taken a 5-year lease on the building to be erected for completion July 1.

Buys Big Service Bldg.—The J. C. Tucker Co. has bought from the General Fire Extinguisher Co. two large buildings near its present service station on Exchange street, Providence, R. I., so that it will have more room to care for owners of Chase and Vim vehicles, for which it has the agency. The present service station it occupies is claimed to be the largest in the State. When the

new buildings are remodeled the main offices now at Narragansett Pier will be moved to Providence.

New St. Paul Agencies—F. Joswich, of the Joswich Manufacturing Co., St. Paul, Minn., has opened the local agency for Chandler cars at 382 Cedar street. H. F. Hine has leased a building at Main avenue and 6th street for the local agency for Federal tires. The Hyatt Roller Bearing Co. of Detroit has established a Northwestern agency at 1400 Hennepin avenue, covering Minnesota, the Dakotas, Montana and Iowa. N. S. Swan, of Boston, in charge. The Heinze Electric Co., Lowell, Mass., has opened a Northwestern branch at 33 11th street S.

New Detroit Service Co. Formed—In conjunction with the Gordon Auto Sales Co., Detroit, Mich., which handles the Chandler, Dort and Ohio, there has been formed the Detroit Motor Service Co., which will take care of the service department of the Gordon company. Headquarters are at 1000 Woodward avenue. Those in charge W. W. Case, former manager of the service department of the Anderson Electric Car Co., H. W. Shay, former foreman in the same department, and E. H. Monasmith, former assistant electrical engineer of that firm.

Chandler's Washington Headquarters in Seattle—Hereafter the Chandler car will be represented in Seattle, Wash., by the Northern Motor Car Co., 909 East Pike street. This company has had the distribution of these cars in Western Washington for some time, but heretofore has maintained its quarters in Tacoma. Its headquarters and service station will hereafter be in Seattle, although it will continue to maintain its branch in Tacoma, where in addition to the Chandler it is distributor for the Maxwell. A branch is also maintained in Olympia and Chehalis, Wash.

Minneapolis Dealers Erect New Homes—The Walter S. Milnor Co. is erecting at Harmon place and 12th street, Minneapolis, Minn., a two-story brick automobile building, 98 by 157 feet, to cost \$75,000, to be ready August 1. The corner section, 38 by 157 feet, will be occupied by the Western Motor Supply Co., and the remainder for the shop and garage of the building company. The garage will accommodate fifty cars and twelve in the shop. The Parker Garage at 10th street and Mary place is having a second story. The change called for engineering skill, as the roof had to be raised seven feet, and it is 125 by 168 feet in dimensions. The garage is in constant use. The work will be done July 1. E. W. Decker will erect at Harmon place and 15th street a \$50,000 building for the Twin City Motor Co. It will be two stories.

(Continued on page 1012)

Automobile Agencies Recently Established

PASSENGER VEHICLES

Pennsylvania

Bellefonte	Oldsmobile	Palace Garage
Biglerville	Saxon	S. G. Bigham
Chamberburg	Saxon	National Auto Co.
Donora	Chandler	R. M. Ridgely
Harrisburg	Pilot	C. H. Mauk
Lebanon	Monarch	J. F. Urich
Oil City	Saxon	Garvey & Malerich
Pittsburgh	Premier	Pittsburgh Mercer Co.
Reading	Saxon	Reading Optical Co.
Sewickley	Chandler	Auto Service Co.
Spring Mills	Saxon	L. C. Lee
Wilkes-Barre	Premier	J. S. Niver

Rhode Island

Providence	Premier	J. O'Donnell
Providence	Scripta	Booth

South Dakota

Brookings	Studebaker	F. C. Fryer
Canton	Studebaker	Sundstrand & Kolarud
Yankton	Oldsmobile	E. F. Nyberg

Tennessee

Lexington	Studebaker	Brown Bros.
Memphis	Premier	Premier Sales Co.
Newport	Chandler	J. R. Seehorn
Rogersville	Saxon	Kenner & Co.

Texas

Abilene	Chandler	A. E. Cullum
Austin	Oldsmobile	W. T. Wroe & Sons
Austin	Premier	Ewell Nalle
Caldwell	Chandler	J. F. Cobb
Cuero	Oldsmobile	E. S. Hall
Galveston	Chandler	Taylor Motor Co.
McKinney	Studebaker	R. L. Crockett
Memphis	Saxon	W. Wilson

Utah

Gunnison	Oldsmobile	J. W. Edwards
Orderville	Oldsmobile	H. Chamberlain
Salt Lake City	Beardsley	Electric
Tooele	Oldsmobile	J. H. Tate

Virginia

Bristol	Oldsmobile	Bristol Hardware Corp.
Martinsville	Chandler	T. G. Burch
Marion	Chandler	Marion Auto Co.
Portsmouth	Moline	Portsmouth Mch. Wks.
Pulaski	Chandler	P. C. Massey
Wytheville	Chandler	Pierce & Company

Washington

Aberdeen	Pilot	J. H. Pittenger
Olympia	Chandler	V. E. Myers
Olympia	Chandler	A. N. Dazy
Tacoma	Beardsley	Electric

Commercial Vehicles

PASSENGER VEHICLES

West Virginia

Huntington	Saxon	H. F. Shank
Huntington	Stearns	W. N. Rarden
Parkersburg	Premier	J. Crotty

Wisconsin

Algoma	Argo	Haney, Gasper White Co.
Berlin	Oldsmobile	Johnson Fortnum Mch. Wks.
Brillion	Studebaker	R. A. Schultz
Brodhead	Briscoe	H. E. Everson
Delavan	Franklin	W. H. Stewart
Dodgeville	Reo	G. Elvod
Eau Claire	Chandler	Storyer Auto Co.
Ft. Atkinson	Chevrolet	Vance & Roos
Ft. Atkinson	Briscoe	North Side Garage
Ft. Atkinson	Metz	North Side Garage
Galeville	Oldsmobile	A. J. Olson
Forestville	Case	A. Jennerjohn
Galesville	Overland	A. J. Olson
Gillette	Buick	Gillette Machine Co.
Grand Rapids	Moline	C. L. Duncan
Grafton	Oldsmobile	Clausing & Krax
Green Bay	Grant	West Side Garage
Greenwood	Maxwell	Arbs & Baker
Kewaunee	Dodge	Dvorak & Gaynor
Ladysmith	Ford	Ryall's Garage
Lake Geneva	Ford	Lowry Brothers
Marsfield	Cadillac	Lang & Sherman
Marsfield	Grant	H. Wegner
Milwaukee	Baker	L. & H. Auto Sales Co.
Milwaukee	Elkhart	J. Tellier Auto Co.
Milwaukee	King	Lauson-Salentine Co.
Milwaukee	Chevrolet	Freitag & Benkert
Monticello	Buick	F. A. Henry
New Richmond	Chevrolet	Lynch Brothers
New Richmond	Cornelian	R. L. Minier
New Richmond	Reo	Auto Equipment Co.
Reedsburg	Moline	A. Siebert Hdwe. Co.
Rhineland	Chandler	C. A. Conro
Rice Lake	Briscoe	E. M. Smith
Rice Lake	Hupmobile	E. M. Smith
Schlesinger	Oldsmobile	Klettart Brothers
Sturgeon Bay	Saxon	L. Nebel
Two Rivers	Oakland	J. H. Hamaechek & Sons
West Bend	Paige	F. W. Benkendorff
West Bend	Saxon	F. W. Benkendorff

Wyoming

Basin	Metz	G. R. Hoover & Co.
Basin	Detroit	F. Johnson
Chugwater	Metz	R. G. McGrew
Ft. Steele	Hudson	H. O. Barber
Thayne	Thayne	G. Hemmett

COMMERCIAL VEHICLES

California

Sacramento	Moreland	C. M. King
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Indiana

Richmond	Koehler	Shirley & Gaar
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Kentucky

Louisville	Republic	P. M. Andriot & Sons
Louisville	United	States

Massachusetts

Boston	Rowe	E. F. Bunker
Boston	Denby	Denby Motor Truck Sales Co.

Michigan

Adrian	International	City Garage
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Missouri

Eureka	Koehler	T. Blomes
Richwood	Koehler	Kagay Bros. & Shaffer

Nebraska

Hastings	Koehler	S. Schultz
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New Hampshire

Manchester	G.M.C.	Bourne & Stone
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New York

Cadyville	Koehler	F. M. Murray
Westbury	Koehler	M. Knippling

Ohio

Bellefontaine	Koehler	Ford Sales Co.
Richwood	Koehler	Kagay Bros. & Shaffer

Tennessee

Nashville	Republic	Hatsfield Auto Co.
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Utah

Ogden	G.M.C.	Fell Wright Co.
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Virginia

Lynchburg	Koehler	Bowles Auto Repair Co.
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Washington

Harrington	Federal	G. A. Kitt
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Wisconsin

Rhineland	Overland	Oneida Garage Co.
Schlesinger	Oldsmobile	Kletti Brothers
Spooner	Imperial	Sutter, Simpson & Stengel
Spooner	Dort	Sutter, Simpson & Stengel
Spooner	Overland	Sutter, Simpson & Stengel
Spooner	Dodge	Sutter, Simpson & Stengel
Spooner	Buick	Sutter, Simpson & Stengel
Sturgeon Bay	Saxon	L. H. Nebel
Whitewater	Moline	Knight
Whitewater	Knight	A. A. Coburn & Son

to engage in the garage and repair shop business. A garage will be erected at once for the new concern by E. R. Williams, father to the senior partner. Sutter, Simpson & Stengel, agents for several leading lines, the business being conducted in connection with a large wholesale and retail lumber business, have broken ground for a modern garage building to cost \$5,000. It will be of brick and steel construction, one-story, 50 by 90 feet, and equipped with a complete repair shop. C. S. Anderson, an expert mechanic, of Lake Geneva, Wis., is establishing a general machine and automobile shop in that city and will make a specialty of sheet metal work.

Recent Michigan Garage Changes—John Cox, distributor for the Dort, Hollister and Paige cars in Flint, Mich., has leased the old Matson blacksmith shop, which will be remodeled and made into a garage and salesroom. Green & Judson, Fenton, have purchased the garage business of Ed. Jennings. Koontz & Troy, St. Joseph, are having a new garage erected on Main street. It will be 44 by 132 feet in size. W. R. Campbell, of Evart, has sold his garage to E. S.

Gough. D. J. Miller, Diamondale, has purchased the Old Creamery building and will start into the garage and automobile repairing business, making a specialty of Ford cars. S. B. Campbell and Karl Steen have opened an automobile and machine shop in the Coe Mfg. Co. building, Fenton. The J. C. Cristy Sales Co., Pontiac, agent for the Studebaker cars, has opened its new showroom at 199 South Saginaw street. A. B. Winans, of Nashville, has opened a new garage and repair shop. M. E. Donnelly has opened a garage and taxi service at Sixth avenue and Chippewa street, Flint. The Wolverine Auto Co., Lansing, has bought the Coliseum Rink, East Ottawa street, and will remodel it as a garage, with showrooms for cars and accessories. The Kalamazoo Implement Co., Kalamazoo, Studebaker distributor, has moved into its new quarters at 114 East Water street. The old garage at 115 East Water street will be used as service station and repair shop. Ames & Unger, of Belding, Mich., have opened a garage and machine shop. An automobile accessory and supply showroom has been opened in connection with the other business.

Recent Wisconsin Garage News—J. R. Williams and George Richards, Winneconne, Wis., have formed a partnership